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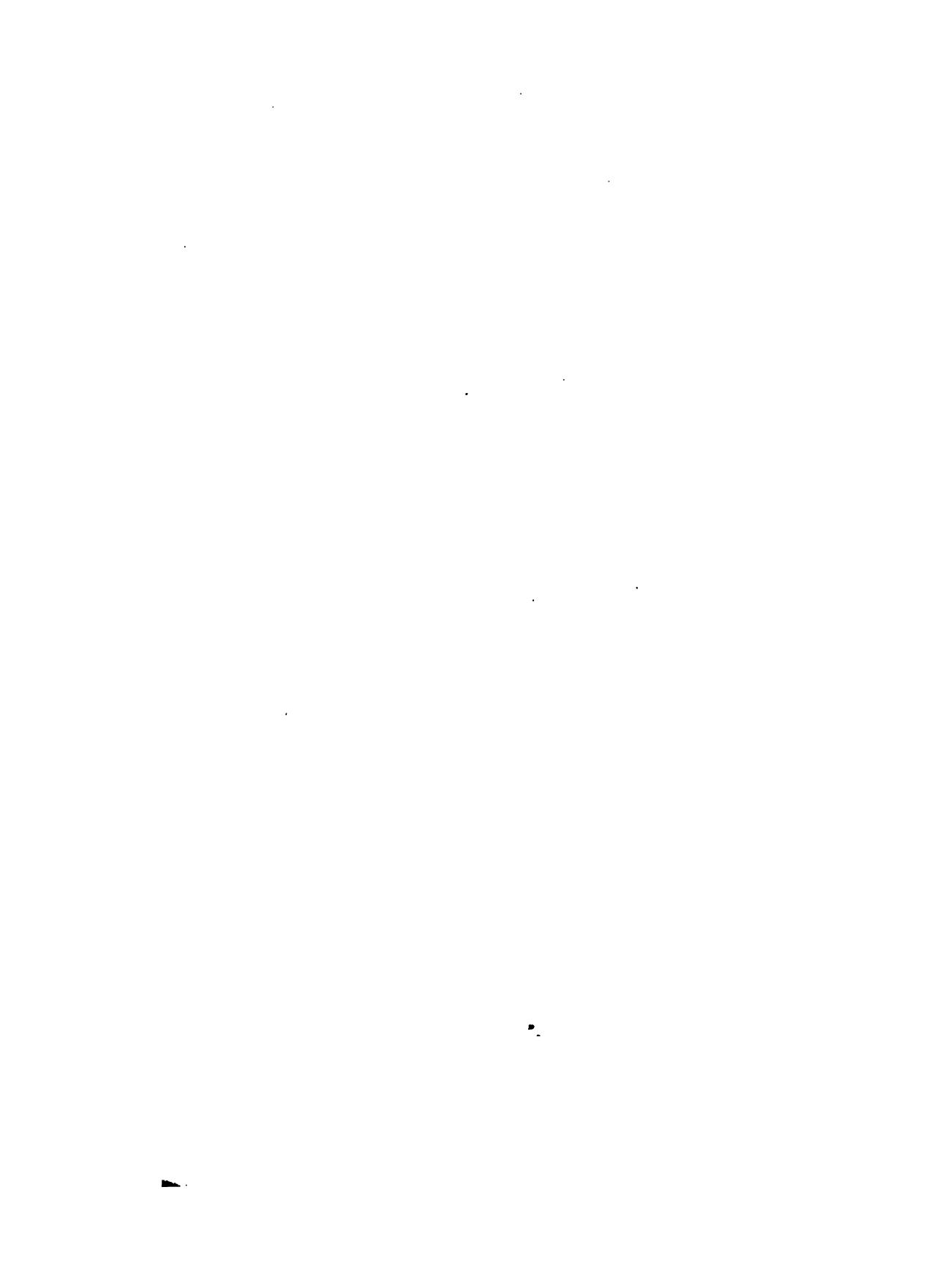
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ADOPTED IN THE
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SCOTLAND.

VOL. II.

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SCOTLAND;
WITH
SOME OBSERVATIONS ON THE IMPROVEMENTS OF
WHICH THEY ARE SUSCEPTIBLE.

DRAWN UP FOR THE CONSIDERATION OF THE BOARD OF AGRICULTURE.
WITH A VIEW OF EXPLAINING HOW FAR THOSE SYSTEMS ARE
APPLICABLE TO THE LESS CULTIVATED PARTS IN
ENGLAND AND SCOTLAND.

BY THE RIGHT HONOURABLE
SIR JOHN SINCLAIR, BART.
FOUNDER OF THE BOARD OF AGRICULTURE.

The Third Edition.
IN TWO VOLUMES.

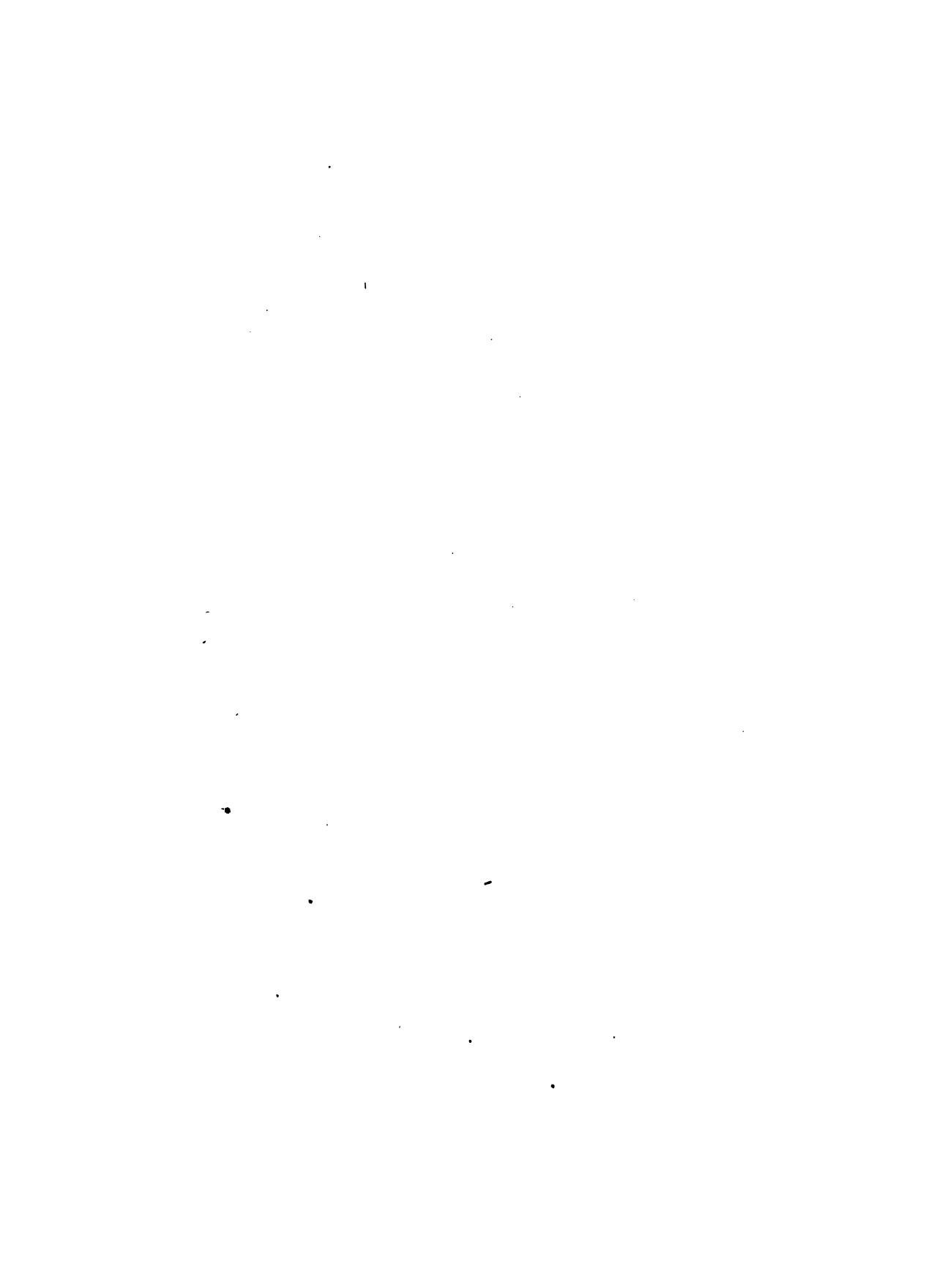
VOL. II.

"Knowledge is Power." BACON.

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AN ACCOUNT
OF THE
HUSBANDRY OF SCOTLAND,
MORE ESPECIALLY AS PRACTISED
IN
ITS BEST CULTIVATED DISTRICTS.

CHAPTER II.

SECT. XI.—*Of Soiling.*

BY *soiling*, is meant the feeding of stock with cut green food, instead of pasturing them.

The origin of the word soiling is unknown. Mr Young supposes it to be a mere farming barbarism*.

The introduction of soiling into England is also unknown. Hartlib mentions it, as a practice in Kent about the middle of the seventeenth century. It was very general in Hertfordshire about seventy years ago. It was probably derived, like many other useful practices, from the

* Some imagine that *soiling* means *making soil*, that is, according to Johnson, “*fitch or dung.*”

Flemings *. It certainty has been long known abroad, and several interesting communications regarding it, will be found from its foreign correspondents, in the earliest publications of the Board of Agriculture †.

The soiling of horses was introduced into Scotland about fifty years ago. It was practised, however, but by a few, and it was not till about the year 1778, as Mr Brown of Markle informs me, that the system of regular soiling took place in East Lothian ‡. Before that time, horses generally received a small quantity of clover during the night, but were herded in the forenoon, and the evening, on the pasture lands, by the boys then employed as plough drivers.

* Cromwell gave £.100, a great sum in those days, to establish the husbandry of Flanders in Hertfordshire.

† See Baron D'Alton's Letter, annexed to the Middlesex Report, and Dr Thaer's paper printed in the second volume of the Communications to the Board.

‡ Lord Kames has given a curious description of the old mode of feeding horses in the summer season, in Scotland. He describes them as being fed in balks between ridges of corn, and often reduced to thistles, the time of the men being consumed in collecting, and that of the horses in eating them. This was a kind of soiling. Sometimes, what was called *hained grass*, was reserved for them : but how often did it happen, that the man appointed to attend them fell asleep ? and the horses then trespassed on the corn ;—dogs were employed to chase them from it ; the horses were driven about, and their fatigue was little less than when they were at work. If they were tethered on the hained grass, the half of the produce was lost, being trodden under foot ; the horses also often broke loose, and destroyed the standing corn. Even in inclosures much of the produce was trodden under foot ; the horses were pestered with flies in hot weather ; they could not feed with ease ; they had no time for resting ; and much time was lost in laying hold of them for the yoke. Besides, few inclosures were then in sufficient good order to keep in horses when they saw corn ; and, if they once broke out, it was in vain to think of imprisoning them afterwards.—*Kames's Gentleman Farmer*, p. 172.

After two-horse ploughs were introduced, soiling was generally resorted to, and has been more or less followed ever since the introduction of clover into general husbandry. A few farmers, however, still think it beneficial to run their horses in an inclosed field through the night.

Lord Kames, in his Gentleman Farmer, published in 1776, has strongly inculcated the advantages of soiling, and boldly declares, "I despair not to see all the corn-farmers in Scotland depending on red clover for the summer food of their cattle*." His hopes are fortunately now in a great measure realized.

This important subject shall be explained under the following general heads : 1. On the articles used ; 2. On the different sorts of stock thus fed ; 3. On the advantages of the practice ; and 4. On its disadvantages.

1. The article principally used for soiling are, red clover, (with a mixture of rye-grass) and tares. Sometimes lucern, barley, oats and beans, are resorted to; but sainfoin, though cultivated in many parts of England, is unknown in Scotland †.

Red clover, with a mixture of rye-grass, is the article by far the most generally cultivated in Scotland for soiling ; nor is that to be wondered at, considering the facility with which it is raised, and the luxuriance of its produce. Lord Kames calculates, that a horse of a middling size, will eat ten Dutch stones of clover and rye-grass daily ; some, however, will go the length of sixteen or seventeen stones. An

* Gentleman Farmer, part 1, chap. 9, sect. 1.

† One of my correspondents states, that he thinks soiling with rye might turn out well, as the surest and earliest growth known in this country, more especially if cut with the sap, before it shoots. But this idea has not been justified by experiments.

ox or cow will eat about eight stones*. Even at these rates, a good crop of red clover will feed a number of animals on an extensive field.

White clover is but a small plant, and not easily collected in heaps for food; but it is astonishing the quantity it has produced, when frequently cut, and manured with coal ashes†.

Lord Kames strongly recommends sowing a mixture of yellow clover with rye-grass and rib-grass, but cocksfoot would probably answer better. These plants are earlier by a fortnight than red clover, may be cut about the middle of May, and if the season is favourable, they may be again cut as late as even the middle of November.

Lucern has been tried in Scotland, on a small scale, and has completely answered. An account has been already given of the success attending the culture of tares. It may be proper to add in this place, that it has been found highly useful to mix some oats among the tares, to keep them from the ground in wet seasons.

One of my respectable correspondents, (George Culley, Esq.) informs me, that he has known barley and seeds, (that is, clover and rye grass) frequently sown together and cut before the barley shoots, when it produces a great crop, and afterwards a good second cutting, affording an excel-

* Gentleman Farmer, p. 178. Mr John Shirreff remarks, that no conclusion can be drawn, as to quantities of herbage necessary to support the different animals, unless their weights be specified. An ox of eighty stones will eat as much as two of forty stones each; and a London dray horse would probably consume as much clover as ten Shetland ponies.

+ A new species of white clover has been lately discovered in Essex, which it is supposed will be as productive of herbage as the common red.

ient food when soiled, either for horses or cattle. Winter barley may be cut once, and will afterwards produce a crop of grain.

Some cow-keepers near Edinburgh soil their cows with cut barley. Finding that clover was apt to fail on the rich lands near Edinburgh, owing to the heavy crops of barley which these lands produced, they resolved, instead of keeping the barley to be ripened, to cut it for their cattle young, a practice that has been found to answer. The first crop is equal to clover, and the cows are as fond of it; the second crop is not so good as the second crop of clover, but is far from being deficient, and would be more abundant if they would only cut the first crop earlier. At the same time, the greater the proportion of clover the better, as grain crops cut green are harsher than clover, tares, and other leguminous crops, and have not so feeding a quality.

Instead of tares, an intelligent correspondent soils four or five acres of Tartarian oats, commencing about a fortnight after Midsummer. He finds this plan to answer uncommonly well, but he begins soiling with clover and ryegrass. The oats should be sown at different periods, to come in succession.

In Ayrshire, whenever the crop of beans is not likely to be productive of pods, Mr Blane of Blanefield informs me, that they are mown down as green food for horses, who are fond of that food, after being a little accustomed to it. This however, at least, is but a rare practice. It has been tried with stall-fed oxen, and they thrrove, it is said, better on that food than on any other.

2. The different kinds of stock soiled: 1. Horses; 2. Cattle; and, 3. Pigs; and the manner in which they ought to be respectively treated shall next be treated of.

1. *Horses.*—There cannot be a doubt of the advantage of soiling working horses, a practice which Mr Rennie of Phantassie considers to be almost indispensable, upon all corn farms, as it enables the farmer to make his summer-threshed straw into dung, and to procure a greater quantity of work from his servants and horses. It is thus indeed, that a large quantity of valuable and rich manure is produced, by which alone he is enabled to carry on his rotation of cropping to the same advantage. The following is a short sketch of Mr Rennie's practice of feeding horses through the year. He generally gives them cut grass about the 8th of June, or when the grass is fit for cutting. He employs one man to cut and bundle the grass, which he will do for twenty to twenty-four horses, with a little assistance occasionally; and having an interest in making as little waste as possible, he takes care to give no more than what is absolutely necessary. The horses are kept on the first crop until it begins to get hard and dry, when, if the second crop of clover is not ready for cutting, they get tares, of which he always takes care to have a plentiful supply, with which, and the second crop of clover, they are carried on until the end of October, a week or too sooner or later, as the season may answer. During all this time, they get corn, more or less, according as they are wrought. When the second crop of clover and tares is consumed, he then begins to feed with his best hay and corn. Good feeding, at that season, he finds of the greatest importance; as much of the horses' future health and strength, for the next year, depend on the good management of them when taken from green to dry food. After a month's good feeding with corn and hay, by which time the hardest of the labour is generally over, he puts them on peas and bean straw, with a feed of boiled beans mashed up with a little ground barley, and which they get every evening; this

keeps their belly open, and in a great measure prevents the bad consequences that often arise from damp peas or bean straw. In this way he feeds them, until the first or second, or perhaps third week in April, according to the quality of the bean straw, and then puts his horses again on hay, on which they continue until they get cut grass. Besides the advantage already mentioned, he remarks, that if his twenty plough horses were to be grazed, it would require a field of at least thirty to forty acres of extent, in order that the grass might be sufficiently good to allow the horses time to fill themselves, and to have time to rest. Think of the waste that must be occasioned by these horses trampling over it, besides what must also be wasted in the pursuit of catching them for the yoke. Mr Rennie has no doubt that one half the quantity of ground, when soiled, will feed the same number of horses. He adds, that a horse that is from nine to ten hours a-day in the yoke, has no time to gather his meat; he therefore ought to have it laid down ready for him in the stall, to begin to eat when he comes in from his work, so that he may instantly fill his belly, and retire to rest.

Another correspondent informs me, that he keeps for the cultivation of his farm twelve horses, and for their maintenance, he appropriates twelve acres of broad clover, with a mixture of rye-grass; this, when a full crop, he calculates will serve them five months, and will admit of four acres of the first crop being made into hay; the whole of the second crop they will be able to use green, even although twelve double cart-loads of good stable-dung *per acre* should be applied immediately after the first cutting, which will always secure a good second crop, and in a moist season will produce a very heavy one. The dung so applied, however, ought to be very short, and well made, otherwise, it will be

lisble to mix with the clover, in cutting and raking*. My correspondent also reckons it, one of the best preparations for a wheat crop with one furrow after the clover; much nicely, however, is required in spreading the dung, and a heavy stone-roller, drawn by two horses, will be applied with great advantage, as soon as the dung becomes dry after spreading; for, without having recourse to this expedient, much of the dung would be raised in the second cutting, and a considerable quantity of the grass would be lost, from the inequalities formed by it on the surface, which would prevent the application of the rake; and it also has the advantage of incorporating much sooner with the soil without any waste. He generally commences cutting broad clover for the stable, in the last week of May or first days of June, and continues until about the end of October; after that time the horses are put on hard food.

An objection has been urged to the practice of soiling horses, namely, that it is difficult to provide them with young grass†; but that is completely obviated by the practice

* It is said, that the clover produced by new dung, must be rank and unpalatable, and that it would be more advantageously applied to the turnip crop. But where there is no land fit for turnip, that objection is obviated.

† Mr Somerville states, that among the disadvantages attending soiling, one is, that before the second crop is fit for cutting, the first gets often so tough, stock do not eat it well. The objection, however, is easily removed by the cultivation of as many tares as will supply the interval between the first and second cutting; a practice now very generally followed. Indeed, Mr Hume of East Barns informs me, that he is accustomed to eat down five or six acres of his young crop of clover, on which he pastures 14 horses from the 15th of April to the 1st of June, when the other grass is ready for cutting, and it never fails to give a good crop when the first crop begins to turn too hard for the horses. This plan saves many horses lives, and a great deal of more work will be got from horses thus fed, with two feeds of corn, than from the same horses that get three feeds and the best hay. There

adopted in Roxburghshire and other districts. The clover that is intended to be cut early, is always saved in the spring months; but such as is meant to be cut in the last half of July, and the second and third weeks of August, is always eaten down by the sheep in the spring; by which means it is in a good state when the other becomes hard and unpalatable. This method is also followed by Mr Brown of Markie, who thereby seldom fails of obtaining green food of the best quality for his working stock, not only at the critical period here alluded to, but also to the very conclusion of the grass season.

Mr Nisbett of Mersington, in the spring, puts in ewes and lambs on the new grass, in the proportion of two pair per acre, and sometimes more. He occasionally also eats the herbage of a part of his hay land *, in the spring, with his fattening sheep, when he wishes to keep them back for a good market; and that part he cuts for the horses before the second crop can be ready. This insures the horses a succession of young grass, on which they thrive much better than when it gets dry and stalky.

It is certainly desirable, by following this practice, to keep the clover young and nourishing, even though a great-

cannot be therefore a greater improvement, as without following it, or sowing a considerable quantity of tares, no farmer can be sure of having green food for his working stock in August and September, if severe drought occurs during these months.

* It is remarked, that there is certainly a risk in spring, eating a part of the herbage of the land intended for hay; as in proportion as it is eaten, so in proportion is it exposed to the influence of the sun and cutting winds, and more liable to the injury of drought. It so seldom happens, however, but there is a powerful supply of moisture at or about Whitsunday, Old Style, that the injury dreaded can rarely happen. At all events, it is desirable not to eat the young grasses too bare.

er quantity of ground shouid thereby be rendered necessary.

In regard to soiling, a respectable correspondent makes this distinction, that where there is grazing land of good quality annexed to the farm, it is, in point of convenience, of less consequence; where that does not take place, it seems both profitable and necessary to soil with red clover and tares. If the rich grazing land, however, can be cut for soiling, would it not be desirable to adopt the soiling system, if one acre will go as far as two?

Mr Somerville of Athelstonford Mains, is decidedly in favour of soiling, thinking it scarcely possible, that the labour of a farm, according to the present system, could be well carried on, if horses were fed otherwise; besides, in that way, one acre of grass will go as far as two eaten on the field, whilst the straw threshed in spring and summer is thereby rapidly converted into rich dung.

Mr Somerville gives the following estimate of the expence of soiling horses, and of the manner in which it ought to be conducted. He estimates, that a Scotch acre is, in usual seasons, consumed by a pair of horses.

Two horses nine weeks, first cutting at 10s.

per week,	L.9	0	0
Two ditto, four ditto, second cutting, at 10s.	4	0	0

Total value of the produce,	L.13	0	0
-----------------------------	------	---	---

Deduct for cutting and carrying home,	2	0	0
---------------------------------------	---	---	---

Clear profit per acre, after paying expences,	L.11	0	0
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Besides the value of the dung accumulated during the process, which may be fairly estimated at L.3 per acre.

Such a crop, if made to hay, will rather exceed 200 stones

per acre Scotch, of 22 lib. avoirdupois to the stone. If the same were depastured and allowed to get well up, an acre would keep one horse for thirteen weeks; hence Mr Somerville considers, that one acre of clover and rye-grass, according to the soiling system, will feed the same number of animals that two will do, when the ground is depastured.

He generally begins cutting for soiling in the first week of June, though at first he goes over much more ground than afterwards, yet the second crop is much better, and what is early cut, comes in succession when the first crop gets old and tough. He never has grass that will cut a third time with advantage. His horses get water twice a day, which he thinks indispensably necessary for working stock *; if water is in the court, where they can take it at pleasure, so much the better.

Milch cows give more milk when soiled than when pastured, provided due attention is bestowed in furnishing them with a regular supply of grass at stated periods, say six times each day, and keeping them clean and free from nastiness. The very trouble that is saved by milking the animals in a *byre* or cow-house at hand, instead of going to a distant field, is of considerable importance.

Lord Kames stated, that many a summer, for seven or eight weeks running, his horses had been daily employed in bringing lime from a quarry fifteen English miles distant, *fed on red clover only*; and at the end of the season they were as plump and hearty as at the beginning; but all intelligent farmers are now of opinion, that it is necessary to give horses a feed of oats *per day*, when they are carrying

* It is found by experience, that even posting horses do well soiled, but then they must get no water. When fed on moist and succulent herbage, the less water, in general, the better.

lime, coals, or other heavy articles, to or from any considerable distance.

Mr Wilson of Simprin, in Berwickshire, approves of soiling in the middle of the day, in hot weather; but he states, that it is not generally practised in Berwickshire, where the work-horses are accustomed to move quicker than in the Lothians. He does not think that it would answer in every situation; and is of opinion, that cut grass is too soft a food for horses used in driving lime. By giving a feed of oats, however, that objection would be removed.

It is also contended, that horses are much better to be out a few hours on pasture every day, instead of being kept constantly in a stable, in consequence of which, they are apt to turn stiff, and never thrive so well. But this objection is obviated by the practice of a number of respectable farmers, who, when they soil their horses, give them their green food in bins in the yard, instead of feeding them in a stable; and Mr John Shirreff remarks, in regard to the idea that horses, when soiled, are liable to become greased, it is not well founded. There are few greased horses in East-Lothian, where cut clover is constantly used for soiling. Indeed, the idea of horses becoming greased, when regularly fed, and wrought with moderation every day, is absurd. Exercise is the surest preventive. It is in winter that draught horses are most apt to become greased, from wet roads, and want of exercise.

Mr Somerville of Athelstonford Mains is convinced, that young draught horses may be reared much cheaper by soiling, than in open pastures;—a point of considerable moment to industrious farmers.

2. *Cattle* *.—Though many are of opinion, that it is pro-

* Mr Curwen strongly recommends soiling milch cows. He says, that

fitable to soil horses, yet this practice is not so generally approved of in regard to cattle. Mr Brown of Markle, however, has, with his usual ability, given a very satisfactory account of an experiment he tried, which seems decisive of the question *. In 1805, he soiled twenty-four Aberdeenshire cattle ; and after giving a full detail of the expence and profit, computes the gain to be fully *50 per cent.* when grass is consumed in that manner, even when no additional sum is stated as the value of the large quantity of fine dung thereby manufactured. From this account, it appears, that these twenty-four cattle were completely fed, from the first of June to the first of October, upon eleven acres of clover and tares ; and he now informs me, that he is quite satisfied; it would have required eighteen or twenty acres of the same grass to have fed them had they been pastured upon the field. This is a decisive fact in favour of the system, especially as Mr Brown had an equal number of cattle in an adjoining field, which did not sell one halfpenny higher than the soiled ones, though they consumed or destroyed a great deal of more grass. With the exception of one season, when his clover field was at a great distance from the farm-yard, Mr Brown has regularly soiled cattle since the above period.

The soiling of cattle, indeed, is of more importance upon clay-land farms, than where the turnip soil prevails, as in the former it is difficult to use the straw to advantage in any other way ; whereas upon a turnip farm, it is hardly possible to reserve straw for the purpose of soiling, and it

a cow of the short-horned breed will require eight stone (14lb. each) of cut clover, in the twenty-four hours ; but with smaller breeds, there can be no doubt, that a less quantity will suffice. Report to the Workington Society, anno 1810.

* See Farmer's Magazine, vol. vi. p. 460.

cannot be done without straw, or some other substitute. On the other hand, it is maintained, that sometimes half the turnips may be eaten on the field, without any straw being used: that a considerable saving of straw may be effected, by bottoming the yard with moss, earth, ashes, and other such articles; and that if straw be economically applied in littering turnip-fed stock, there will be abundance to litter a good many soiled in summer, where good and luxuriant crops of grain are raised.

A detailed account has been transmitted to me, regarding the proper mode of soiling cattle, by Mr James Cuthbertson of Seton Mains in East-Lothian. He recommends, that cattle, intended to be kept in this way during the summer, ought to have some succulent food given them, at least four weeks before they are entirely confined to eat green clover, and for the first fortnight, a flake with oat straw, or a little hay, should be kept in the court, because at that season of the year, the grass being strong, its laxative effects are so powerful as to prevent feeding. Plenty of water ought to be constantly kept in the court; an open shed also for the cattle to retire to, in hot weather, would be a great comfort to them, and very materially aid their feeding; and if it is found that they do not frequent it, he would recommend keeping them at the stake during the heat of the day: recourse likewise ought to be had to the *byre* or cow-house, during any continuance of wet weather. There food ought to be given them four or five different times a-day, so that it may be always fresh, and new cut, which will prevent the waste that would otherwise be occasioned by giving them large supplies at a time, and will also induce them to eat more plentifully. Regular litter should be given them, and the court kept as smooth as possible, in order to preserve them from being overheated when they lie, which they ought to be encouraged to do as much as possible.

It is also of much consequence, that regular attention should be given to keep them clean, so as to prevent a foulness of the skin, which may happen if the weather is warm, and litter not plentifully and regularly supplied. When the soiling of cattle is intended to any extent, it ought to be adverted to, in sowing the grass for them, that less rye-grass than is commonly used for hay, should be sown with the clover; likewise, that when the clover begins to get hard, some tares, sown early in the spring, ought to be substituted in its place. In East-Lothian, it rarely happens that the weather will permit the cattle to lie out after the month of September; but as this in general is too early for commencing feeding with turnips, unless the weather is dry and warm, it would be better to feed them at the stake, upon the second crop of clover, which at this time will be in its best state for feeding. Some recommend a few oats on the straw to be given, for the first month after the cattle are changed from the clover to turnips; but in my opinion that expence is not necessary.

Mr Hope of Fenton found that young cattle, tied to the stake, improved much to his satisfaction. From their age he could not expect them to fatten for the butcher. He would prefer, at the same time, allowing them liberty to feed in an open yard, with a proper shed, into which they might retire when they thought proper, to the stake. He thinks, however, that cattle will thrive better constantly tied up in a well-aired house, than confined in an open yard, without having an opportunity to take refuge from the heat of a summer's sun, and the vermin that harass cattle at that season of the year. Water was brought into two yards, where he tried his experiments, for the use of the cattle; those in the house were let out once or twice a day, according to the nature of their food, to drink, upon doing which they were immediately tied up again. He

found it of the utmost consequence to have them always well supplied with water, especially when the grass begins to turn hard, as he observed once or twice, when the servant had neglected to supply them in proper time, (although for a very short period only), that scarcely a beast thought of putting his mouth to the grass, but all stood looking with the greatest earnestness till relieved by a proper supply of that necessary element. Wherever soiling, therefore, is to be practised, he holds it of the first importance, that a plentiful supply of water should constantly be at hand, completely independent of a servant to supply the yard, either by a pump or other manual operation *.

Some farmers in Berwickshire, who long persisted in the system of soiling their young cattle, have now abandoned it, from the idea of its insufficiency to raise stock, to the same weight and size as they would have reached, had they been grazed in the common manner. They admit, however, that beasts, by being soiled, may be well prepared for being laid on turnips in October; and they ought to

* Mr Low observes, that though an abundant supply of water is, in general, proper for cattle, yet that less is necessary, when fed on such moist and succulent food as cut grass. He has learned from good authority, that young horses and cattle have been known to thrive very well in a pasture field, without a drop of moisture more than they obtained from the dew on the grass in damp mornings. This, however, is not to be imitated; and where the water is not conveyed to the court by troughs or otherwise, the cattle must be driven to it at least once a-day, and allowed ample time to drink. If the water be near at hand, it may perhaps be advisable to water them twice a-day. It is remarked, that calves should never be allowed any water during the first six months they are turned out to pasture; for when they are allowed to drink much water at an early age, they will become big-bellied, and otherwise mishapen. Grown cattle, however, cannot do without a sufficiency of water, more especially when living on dry and coarse food.

consider, that it is not the weight or size of any individual animal, but whether *more value* can be raised on an acre soiled, compared to one of a similar nature pastured, that must determine the question.

An intelligent correspondent, (Mr Stewart of Hillside), informs me, that he has been in the use of giving cut clover to milch cows in the months of July and August, when the weather is hot. At that season they come in from their pastures between eight and nine in the morning, and are not put out again till four in the afternoon; in that interval they get a full feed of clover. The advantages of this to the pasture, the cattle, and their produce, are evident. He reckons, that an acre of ordinary clover, will serve fifteen cows for this purpose, for two months. Others have tried giving cows clover in the yard, but found that they did not give so much milk as when they were at pasture. That, however, is not inconsistent with the advantage of soiling them in the middle of the day.

Mr Park is of opinion, that a supply of water is very requisite when cattle are put on clover; and if a running stream cannot be obtained where they are kept, a pump-well, with attention, may supply its place. On the whole, he is of opinion, that there is more advantage to be derived from soiling horses than cows. That, however, is a point that has not yet been so fully ascertained as, I trust, will soon be the case.

Mr John Shirreff has suggested the following practices in regard to soiling, which seem to me peculiarly valuable: 1. That in hot weather the herbage should always be given them in sheds; and, 2. That a supply of the *best old hay* should be given them in wet weather, else the stock must fall off much in their condition, for there is only a certain quantity of moisture which an animal can take into its

stomach with safety, and if that is exceeded, the consequences must be fatal.

8. *Pigs.*—Mr Church of Hitchill also soils pigs on clover, and finds it an advantageous practice. Where cottagers have gardens, and keep pigs, it might be expedient to have a small spot of clover in their gardens to cut for them. In regard to soiling pigs, a discovery has been made of considerable moment. It is, that pigs may be soiled on cut green beans, with great profit, and that they are ravenously fond of them. The Windsor sort is preferred; and the beans should be planted at three different times, for the sake of a regular succession. The feeding may commence in the beginning of July, and may terminate about the end of September. When pork is worth $7\frac{1}{4}$ per pound, the profit, besides a quantity of most valuable manure, is calculated to be about L.10 per English acre.

We shall now proceed to state the advantages of soiling, and the profit to be derived from it.

1. Soiling is peculiarly calculated for *clay-land farms*, more especially if they are situated at a distance from any town where there is a demand for straw. By means of soiling, that straw can be converted into rich dung, which otherwise could hardly be of much value. Upon turnip-land farms, where cattle are fed, the straw is consumed during the winter, and little, if any, can be reserved for soiling. In regard to either description of farms, it is a maxim to be rigorously observed, “ That wherever a crop produces three “ tons of clover, or meadow-grass, per statute acre, at two “ cuttings, and where the distance does not exceed half a “ mile, soiling ought to be adopted.”

2. Another circumstance strongly in favour of soiling, is mentioned by Mr Hume of East Barns. He states it as a

positive fact, (though it may seem extraordinary), that all the lands in his neighbourhood, will produce a better crop of oats, the year after the grass was cut for hay, or for soiling, even twice in one season, than if the grass had been pastured by sheep; and that this takes place, not only on land full of manure, but even where inland districts are managed in the four-course shift of turnips, white crops, grass, and oats, and receive no manure but a thin dunging in the turnip drills. The same circumstance is stated by Mr Brown of Markle, who has made trials of the cutting and pasturing processes, upon soils of almost every description, and uniformly found, that oats taken after cutting grass, were superior to those taken upon a pasture field. The produce of the land, however, must be consumed upon it, and not sold off, unless a fair proportion of putrescent manure is purchased back.

3. The saving of land is a most important consideration. Mr Walker of Wooden is of opinion, that one acre of cut grass soiled, is equal to three used as pasture. But in turnip-field farms, where sheep are partly fed in the fields, much straw, as has been already noticed, may be reserved for stiffer soiling. Mr Somerville states, that one acre of cut clover is equal to two pastured, even of the same field, and sown with the same grass, the clover not being trampled upon, and growing so much faster than if it were often corroded by the teeth of an animal: and another correspondent is of opinion, that 16 acres of clover and tares, will feed as many horses and cattle, as 36 acres of the same kind of grass would do, if used in pasturage.

4. There is also a great saving of food; for animals, when pastured, destroy a great deal of keep in various ways, not only corroding the herbage by their teeth, but by trampling upon it, poaching it, particularly in wet weather, lying down upon it, dunging, and staining. All these are

prevented by cutting the herbage, and carrying it from the field.

5. It has been justly observed, that by soiling, a great quantity of rich and valuable dung is produced, when none could otherwise have been procured *, which may be used upon the cultivated fields, with far greater advantage than could be obtained from the portion of dung left by the animals upon the same field, in the event of its having been depastured; for in this case, much of it would have been scattered on the grass land; much of it wasted by evaporation, dissipated by the sun and air; and much of it carried away by insects. This advantage alone is sufficient to compensate for any trouble or expence attending the practice, more especially on farms lying at a distance from towns, and where manure cannot by any other means be obtained: besides, as the dung and urine of cattle are much stronger in summer than in winter, it is possible, by this means, to procure a species of manure of a very superior quality. Before soiling was introduced, a large quantity of straw always remained after the cattle were turned out to grass, which never could be made half so valuable as under this system †. Under the old system, horse dung, in a pasture field, was almost totally lost, for it was soon eaten by flies, or dried and withered away. Indeed, by its heat, it burnt the grass it fell upon, instead of improving it.

6. Another advantage is, that cattle and horses are not

* It is said, on the subject of the muck produced by soiling, that it is not perfectly correct to state all the profit derived from that article to the acres soiled, as the land producing the straw must likewise be taken into consideration. This, however, cannot be carried to the full extent, as, without soiling, the straw might not be convertible into dung; at least, into dung one half so valuable as when it is manufactured by that process.

† Communication from Mr Brown of Cononsyth, by Arbroath.

liable to the same accidents as under the pasturing system. They are not so apt to be *hove* or *blown*,—a misfortune by which many farmers have suffered considerably *. When milch cows are soiled, it is remarked that they escape the *gripes*, which is a great enemy to them when out, more especially in wet seasons. In the fields also, cows, when pasturing, are often frightened, when in a thriving state, and prematurely slip their calves, to the great loss of the proprietor. Besides, it is well known, that pasturing horses and sheep together, is extremely injurious to the sheep stock going on the same land, which, by the process of soiling, may be obviated †.

7. This practice is also of great use in preventing damage, not only to fences, but to underwood, corn, &c. by *breachy* cattle; and it prevents all the danger of cattle being staked, or otherwise hurt by breaking fences ‡.

8. It is likewise contended, that the practice is advantageous to cattle in a feeding state, as they require, that a sufficient quantity of food to satisfy their wants, should be given them in a short space of time, and they fatten quicker by lying much at rest §.

9. Working horses or cattle are saved all the fatigue of

* A beast that chews the cud, takes in at once a large quantity of green food, especially of red clover, which is extremely palatable when young. So large a quantity is apt to ferment with the heat of the stomach, so as sometimes to make the creature burst. This is considered as a formidable objection to the feeding horned cattle on red clover; but it is easily obviated by feeding them in the house: servants will not readily give more than sufficient, when cutting and carrying is a work of labour.—*Kames's Gentleman's Farmer*, p. 176.

† Kerr's Berwickshire, p. 272.

‡ See Sir C. M. Burrell's paper in the Communications to the Board of Agriculture, vol. vi. p. 2.

§ Adam's New System of Agriculture, p. 11. and 12.

collecting their food after their work is over ; they can fill themselves consequently much sooner, have more time to rest, are protected from the heat of the sun, and the attacks of insects, can be kept in higher condition, and are able to do much more work. In regard to horses, in particular, after having worked nine or ten hours each day, they must stand in need of rest during the cessation of their labour, and this can be better obtained in a cool stable, or open shed, with plenty of litter, than in an open field, where they are exposed to the weather.

Lastly, Working animals are rendered much more tractable, take a liking to those who furnish them with food, and, instead of being sought for in the fields, and being caught with great difficulty, they are always ready for their work. Besides, in the stable, they are not tormented with flies as in the fields, nor are they induced to stand in brooks, or ponds of water, nor under the shade of spreading trees or hedges, by which much valuable pasture is lost.

It may likewise be observed, in the words of Mr Brown of Markie, that the real test of the utility of soiling, is not, whether cattle can in that way be so completely fattened as by pasturage ? but whether or not an acre of clover grass, can be consumed with more profit to the farmer, by soiling, than if cattle were allowed the liberty of pasturage upon it ? This is the true view which ought to be taken of such a question.

The profit derived from this practice may next be explained.

Profit from Soiling.—There is certainly no mode by which artificial grasses will pay so well, as by soiling. In the neighbourhood of towns, from the necessity that cow-feeders and carters are under for such food, the value of clover is immense. Indeed, according to a communication from

Mr Low, L.25 or L.30 per Scotch acre, are no uncommon prices, for the produce of land cut for soiling, which, if it had been let for pasture, instead of being cut, would not have brought more than L.9 or L.10 per acre. Mr Bruce of Grangemuir, in Fife, makes the value of cut grass per Scotch acre, deducting the expence of cutting and leading, L.9, and the profit from dung L.3, 10s.; consequently the total value of one Scotch acre, he calculates to be L.12, 10s. Mr Somerville states the produce at L.13, the expences L.2, leaving the value per acre, where the produce is consumed by soiling horses, L.11 per acre, besides the dung. Mr Kerr, in his Report of Berwickshire, p. 262. states, that an English acre is worth from six to eight guineas, (besides the dung), according to soil and seasons, which does not differ materially from Mr Bruce's statement, whose calculation refers to the Scotch acre. It is said, that an acre of clover and rye-grass, cut and used green, is of equal value, with the produce of the same acre made into hay; and that there is much less risk, whilst at the same time a great quantity of excellent muck is procured. But Mr John Shirreff remarks, that this point must depend upon various circumstances; as the price which the various articles will fetch, or the purposes to which they are applied, which will vary in different situations and districts.

It must not be imagined, however, that this practice, however excellent, is not liable to some objections. These shall be shortly enumerated.

1. It is first objected, by those who disapprove of soiling horned cattle, that in close coverts, the benefit of good air and cooling breezes is exchanged for putrid effluvia, and a noxious heat from different sources; and that the annoyance from insects and vermin, in such a situation, must be greater than in the fields. Here I must however remark,

that where proper sheds are erected, the latter part of the objection is altogether groundless. I may also add, that the daily experience of cattle thriving, though confined, sets aside the whole of this objection. Besides, horses or cattle might be kept in *hammels*, (as they are called in Berwickshire), or small folds, with covered sheds, to resort to in hot or in bad weather, where they would not suffer from confinement. Indeed, covered sheds alone, when properly constructed, are much cooler in hot weather, than the open atmosphere, and are not infested with insects or vermin. By the same plan of hammels, another objection is obviated, namely, that if animals of different strength are confined together, the weaker cannot obtain an equal share of food with the stronger ; for by the hammel system, the weak and the strong may be separated.

2. The second objection is, that the chances of accident and disease are greater, than when the cattle are allowed the natural way of seeking their own nourishment: but it is evident, that they are liable to many more accidents without doors, than within, and, besides, are exposed to the inclemency of the seasons.

3. It is also objected, that in wet soils or seasons, fields are much injured by carts and horses going upon them, to take away the cut grass. They cannot, however, do so much injury as a number of horses pasturing upon the field ; and by adopting the plan recommended by Mr Walker of Wooden, that of using broad wheels, (see Ch. 1. Sect. 6. on Roads), the objection is completely obviated.

4. Another objection to soiling is, that in thin dry land, especially in a dry season, it does not produce grass, of weight and quantity sufficient, as to render it worth while to cut it for soiling. The answer to that is obvious, that in such a case the land must be pastured, and that it is im-

possible to make any arrangement that will suit every soil and every season.

5. Another objection is, that it is difficult to know what to do with a large wintering stock, from the middle of April till, some years, the 10th of June; cattle during that period, if living on dry straw, would be so much reduced, as that it would be dangerous to give them any thing like a full supply of new grass, for several weeks; and before the constitutions of the animals have undergone the requisite change, the best part of the feeding season is expired. But there are few farms on which some ruta baga or yellow turnips may not be grown, to a sufficient extent, for supplying an ordinary stock of cattle for six months; but if these do fail, the alternative remains, of pasturing for a week or two a part of the grass land, till the forwardest fields are fit for cutting.

6. Another argument in favour of pasturage, compared to soiling, is, "that though pastures may, for a time, be much injured by a severe drought, and summer frosts, yet they recover, whenever the weather becomes favourable; but a crop for cutting, if injured by drought, at an advanced stage of its growth, never recovers." And it is said that there is much good turnip soil in Roxburghshire, and in other districts, which, in the ordinary course of seasons, would not produce 50 stones of hay or cut grass equivalent per acre; yet would be excellent pasture, unless in severe droughts, probably equal to land that would give 150 stones of hay per acre. In such cases, it is contended, that pasturing with cattle or sheep is preferable to soiling.

It may be admitted, that soiling is not a practice that is universally to be adopted, but it can hardly be doubted, that even on turnip soils, every endeavour should be made to soil the work horses; and that though it may be advisable to have a reserve of pasturage, even on clay-land farms,

yet that on such farms, not only the working horses, but as many cattle ought to be soiled, as may be necessary to convert the straw into manure : In short, “ that soiling is a valuable assistant to pasturage upon dry soils, and pasture will likewise be found the same to soiling, on clay soils.”

7. The only material objection to the soiling system is, the expence of erecting and keeping in repair the necessary buildings, and the care, trouble, and expence, which are required for the due supply of food and water *: expences, however, which are amply compensated by the numerous advantages already detailed. In regard to covered sheds indeed, which Mr John Shirreff considers to be indispensable where soiling is attempted, he remarks, that this extra expence is imaginary, where winter stall-feeding is practised; because the same sheds will answer for soiling that serve for the consumption of turnip. Where milch cows or fattening cattle are soiled, an additional servant and horse may be necessary, to cut and carry home their grass; but in regard to working horses, no additional expence need thereby be incurred, as the servant who works his pair, has plenty of time, midday and evening, to find them grass, if the field is not far distant †.

With a view of lessening the expence of carrying cut grass from the field to the stable, (the only circumstance that weighs against cut grass in competition with pasture), Lord Kames has proposed to carry the cattle to their food, instead of carrying food to the cattle. For that purpose, he recommends, erecting a moveable shed in the field, all of

* The propriety of giving water, with such moist and succulent food as clover, is much doubted.

† Communication from Mr Charles Alexander.

wood ; and he adds, that it is possible to set a little shed on wheels, to be moved from place to place, without being taken down. This plan has lately been revived by Mr George Adams, a farmer in Worcestershire, who has taken out a patent for what he considered to be a discovery, the importance of which had not previously occurred to any other individual ; and, not being conversant with books on agriculture, was not aware that the very same idea had been recommended to public attention, as far back as the year 1776, when Lord Kames first published "The Gentleman Farmer."*

I have thus gone through the important question of soil-ing, and have availed myself of all the information I have been able to collect upon the subject, in order to bring it more fully under the consideration of the reader. The practice is now thoroughly established in all the improved districts of Scotland ; and I trust that it will soon be uni-versally adopted in every other part of the united king-dom.

Secr. XII.—*On the System adopted in Scotland with regard to permanent Pasture.*

THERE is perhaps no particular, in which the systems of husbandry adopted in England and Scotland, differ more, than in regard to what is called old turf, or perma-

* One of my correspondents saw a shed of this kind, as far back as 1772, on the farm of Wark, but it did not answer.

ment pasture. It is admitted, that by letting land lie in grass for several years, the expence of cultivation is greatly diminished, and that from even indifferent soil, tolerable crops of oats may be raised for two, or even three years, on what, in some parts of Scotland, is called the *out-field*, and in the more northern districts, *afterwal-land*; but that practice, so contrary to every judicious principle of husbandry, has fortunately become obsolete. In regard to land of any considerable value occupied by tenants, when a question was asked regarding old turf, in a district distinguished for its fertility and produce, (The Carse of Gowrie), the answer was, " We do not understand in this part of the kingdom what is meant by *old turf*."

As this is a point, which seems to me of very great moment to the farming interest, I shall state, 1. The observations which have been transmitted to me in favour of old turf; 2. Those which have been urged against it; and, 3. Shall endeavour to draw the practical result from both; to which may be added, some observations on the breaking up, and the laying down of old pastures.

1. *Arguments in favour of old turf.*—Mr Robertson of Ladykirk very ably maintains the advantages to be derived from permanent pasture. He contends, that it is of the utmost importance to have some old grass or meadow land attached to every farm, even where the plough is the principal object of attention. Where the finer sorts of sheep are bred, as the Leicestershire, it is absolutely necessary *; but

* Mr Robertson says, that he does not see how it is possible to keep breeding ewes through winter without permanent grass, unless by means of a very great expence of turnip and hay. New grass, he adds, will not have above a fortnight's start of real rich turf, if it has been saved in winter. The value of the winter pasture of such turf is also considerable.

even in farms strictly arable, it will be found in the highest degree advantageous. The reason is obvious. Where artificial grasses, as clover, are alone relied on for feeding the stock of the farm, in dry seasons, the farmer may be almost entirely deprived of that resource ; old grass would in that case be of infinite value, from the superior nutriment which, when properly kept, it always furnishes. The land should have a sound bottom, and be rather of a moist and loamy quality. It should never be cut for hay, but always pastured ; it should not be top-dressed, so as to deprive the ploughed land of any part of the manure produced on the farm ; the land should be situated near the farm-house and offices ; and it may be in the proportion of about eight acres in a hundred. It is of great consequence to landlords, to preserve such an extent of old turf on every farm, untouched by the plough.

Mr Robertson is also of opinion, that when grass land, from age or other circumstances, gets into that state commonly called rich meadow or grazing land, it should not be opened *almost* on any account. It would be much for the advantage of every farm in Great Britain, were a field of that sort attached to it. No convertible land ought to remain above three years in grass at most. In the neighbourhood of towns, or in a situation where a sufficient supply of dung can be procured, one year in red clover will probably be sufficient ; the best rotation, perhaps, 1. Potatoes or turnips ; 2. Barley ; 3. Red clover, and a little rye-grass ; 4. Potatoe-oats ; 5. Beans ; 6. Wheat. It is evident that this system only can last, where there is street manure, and

Besides, it ought to be calculated, that artificial grasses run the risk of being smothered by strong crops, or destroyed when new sown by dry or wet weather.

dung to be procured in sufficient quantities, otherwise, in the course of a few rotations, the clover crop will become precarious, and would often fail.

In the last place, Mr Robertson states, that rich old grass or meadow land is of infinite value to pasture stock ewes in winter, and to give them their turnip on in spring, previous to their dropping their lambs. It is also of the greatest consequence to sheep of all kinds in Midsummer, especially in extreme dry weather, when the grass on the convertible lands is burnt up. To cattle and horses, at that season, and in that kind of weather, it is a matter of the first necessity. Sheep do pretty well, but the others cannot thrive without green food in the manner of soiling, or old rich turf. Nothing is so destructive to the feet of horses, as confinement on a hard field of new grass at Midsummer. The same thing may be said of cattle of all sorts *. Even the richest of land, when sown down, does not come to real perfection in less than thirty years; and after that period, if properly managed, it may be said to be in a progressive state of improvement; so that it may be a matter of serious consideration for any landlord to allow such land to be opened, if he has a just proportion of it on his property. If he has more than that, he may securely reckon it as a good fund to raise money, by a proper rotation of tillage.

In a farm of 500 acres, one field of 30 to 35 acres of old meadow land is highly desirable; and so on in the same proportion in other sized farms. Old grass certainly feeds large cattle better. In Northumberland it is called the *ox pasture*, tending to prove that it was formerly considered to be better calculated, or more necessary, for cattle than for sheep. At the same time, it is said, that new grass feeds

* Where soiling is practised these objections are obviated.

cattle better till Lammas than even old grass. The best mode of laying down land to grass is, let the land be quite clean, full of lime, and all kinds of manure; let the seeds be, one bushel of real perennial rye-grass, five pounds of red clover, and ten or twelve pounds of white clover.

Mr Low of Woodend observes, that the value of a portion of old grass is not to be considered intrinsically, but in relation to the farm of which it forms a part. Calculations concerning the comparative profit of land in tillage and permanent pasture, he considers, therefore, as of no value in this argument; since it is not contended that land in old pasture, is of greater or equal value with the same land if under tillage; but that it is convenient and profitable to have a small portion of a farm so occupied; in short, that it is not the value of the grass itself, but the greater value it gives to the rest of the farm, by its many important uses, that is to be considered.

Mr Logan of Fishwick, who carried on farming to a great extent, (occupying at one time about 2000 acres of land of various qualities, one half of which he kept always in grass, and the other half in tillage), concurs in these doctrines. When he let Fishwick to Mr John Clay, he would not suffer one particular field to be ploughed up, which had been in grass above fifty years, and which, when properly treated, produces such a great variety and abundance of rich herbage, as soon brings the fattening stock to great perfection. He has also an old grass field at Edrom, where he resides, which has been 100 years in grass, and is supposed never to have been limed; it is a rich black loam, on a gravelly bottom; he top-dressed it with lime in the months of November and December, and had turnips laid on it for his feeding sheep afterwards; it made a most astonishing improvement, both in quality and quantity of food; the

grass was darker in its colour, smaller in the pile, and more luxuriant in its growth.

Mr Logan considers it to be a great advantage to top-dress old grass lands with a compost of earth or moss, lime, and dung, properly prepared; and the best time for laying on that compost is in the beginning of winter, the field being previously eaten very close in the autumn, and left untouched till May for pasture. Old grass land that is constantly cut for hay, requires dressing, as it is annually robbed of a crop without receiving any thing in lieu of it. In counties where turnips are grown, he thinks it would be of great use to those meadow lands, to have sheep fed with turnips upon their surface in the dry weather, which would be a profitable, and not expensive top-dressing; feeding cattle on the sward, with turnip, has not the same good effect that sheep have; cattle sink too deep in the soil with their feet *.

Mr Wilson of Simprin, another Berwickshire farmer, is likewise of opinion, that in every farm, a part of it ought to be old grass, even though it should be in a dead or unproductive state. He is such an admirer of old grass, that he keeps a proportion of it on his farms, though he has the liberty of breaking it up. Land, when grass is sown for permanent pasture, ought to be laid down in the very highest order; if that is not the case, it should never be suffered to remain.

Mr Wilson reckons old grass of equal value as tillage land, and equally productive for man and cattle, with the

* On this subject, Mr John Shirreff remarks, that though sheep, when fed on old turf, certainly do not sink so deep in the soil, and though the heavy treading of cattle may injure the grass, yet such treading may be of great use in destroying *muscis*, with which old grass lands abound, severe poaching being the best cure.

exception of lands in the neighbourhood of large towns, where there is a great command of dung.

Having had the experience of feeding a number of the best oxen that ever were fattened in Berwickshire, it is Mr Wilson's opinion, that large oxen cannot be fed to advantage, after the first or middle of June or July, without old grass; before that period, artificial grasses will answer equally well, with the double advantage of allowing the old grass to get up,—a great acquisition in ox pastures.

As to the quantity of old grass on different farms, he thinks, that from 35 to 40 acres on a 300 acre farm, and from 45 to 50 acres on a 500 acre farm, and so on, is a fair proportion. The time of breaking up ought, in his opinion, to be regulated by its grazing well or ill. It is farther his opinion, that if the land is laid down in the best possible order, the longer it lies the better, or, in other words, it should lie for ever in grass. As to artificial grasses being pastured, the sward will always be too weak for large oxen, and they can never lie so comfortably on it as on old grass; besides other disadvantages, as not standing drought or wet. Nothing indeed but age, can produce that fine variety of plants, so ornamental and valuable in old pastures.

It is contended likewise, that old turf is peculiarly advantageous for feeding, in consequence of the variety of the herbage which it produces. From that variety, the grasses must appear at different seasons; in consequence also of that variety, cattle must be tempted to eat the herbage in greater quantities, and it may not only be more nourishing, but also more easily digested.

The rents at which old grass parks let for in Berwickshire, justify these arguments in their favour. I am informed by that intelligent surveyor of land, Mr Low, that they fetch from 40s. to even L.5 per acre. These rents

vary much in different seasons, rising or falling according to the demand for grass, which last is determined by the proportion of stock in the county. Very frequently, farmers to consume their straw find it necessary to winter more cattle than they can graze ; but rather than dispose of their stock in the spring to disadvantage, they run the risk of taking these old grass fields at very great rents. It is only where these fields are secured at fixed rents, by lease or otherwise, that any profit is to be made by this system *.

Mr Hope of Fenton is likewise of opinion, that it would be desirable to have a certain portion of old grass upon every arable farm. He considers the want of pasture grass, as the point on which the great bulk of Scotch farmers are most defective ; and from the advantages which he has seen derived by a few of his most intelligent neighbours, from pasturing their lands, he is decidedly of opinion, that if a full third of the county of East-Lothian were kept in grass, as much grain would be raised as is at present, with the advantage of all the additional stock that would be maintained upon such an extended pasturage. He desires to be understood as meaning, that this grass should

* It is remarked by Mr Kerr, in the Berwickshire Report, p. 330, that when good soil, properly improved, has been laid down to grass, and has since become rich feeding land, it appears to the Reporter, that no rent can be afforded for it in tillage, which will compensate to the proprietor, for the after defalcation of rent which must take place, when it is again laid down in grass ; at least, so long as good pastures produce the rents which they have given in Berwickshire for many years past. This doubtless has induced some proprietors to throw more of their land into grass, and may operate in time to overstock the market with that commodity ; but should that happen, the evil will naturally cure itself ; and when grass rents fall permanently off, proprietors will readily see their own interests, in letting a portion for tillage.

form a part of the farm under the convertible system, not permanent pasture, which he looks upon as little better than the present system, where pasturage is too little attended to *.

It is further contended, that as the advantage of perennial grass, to a certain extent, is admitted, the discussion is reduced to a mere question of terms. All the difference is, that the advocates for old rich pastures, prefer them to new ones of three or four years, which cannot be of half the value; and wish to have them in a convenient station for their general management, instead of making them a part of that management, and migrating to every part of the farm, with their ewes and lambs, in spring, &c. Besides, upon every large farm, there are soils more or less adapted to grass and corn. The advocates for old pasture prefer to have their perennial grass where they actually find it of best quality,—their opponents make no such distinction between the adaptation of soils.

2. Arguments against old turf.—The advantage, however, of permanent pasture, is denied by many of the most intelligent farmers in Scotland, who are convinced, that convertible husbandry may be more successfully practised. Mr Rennie of Phantassie contends, that none is requisite, and that whatever proportion of it is kept, occasions one-fourth loss of rent to the proprietor, besides the injury sustained by the farmer and by the public. Though artificial grasses, he observes, may not produce milk, butter, cheese, beef, and mutton, of so rich a quality as old pasture, he is satisfied they will produce a larger quantity; the best proof

* On many farms in Berwickshire, the proportion of grass, I understand, is often nearly one-half.

of which is, that artificial grasses, upon land of equal quality, condition, and situation, always let in East-Lothian at more rent than old pasture under similar circumstances. The great advantage of artificial grass is, that it produces food for stock, at least one month earlier than old pasture; by which the stock upon it get such a start, that they keep their superiority throughout the whole season, and it is chiefly by stock, fed in this way, that the early markets are supplied. As to feeding large oxen on old grass, he has had no practice, though he has fed cattle from thirty to forty stones Dutch upon artificial grass. Indeed, full three-fourths of the cattle fed in East-Lothian are fattened on pasture of this kind; and he knows that cattle so fed, will come one month sooner to market, than those of equal condition will, from old pastures under similar circumstances. Artificial grass is also preferable for early ewes and lambs, sick horses, &c.; nor does he think it more liable to suffer from dry weather than old grass, on similar soils, if properly managed. On these accounts, there is not, in his opinion, the smallest necessity for old grass, neither is it practised in East-Lothian, except, perhaps, in a few cases, where there happens to be some hilly or rocky pasture; there it may be for the interest of the tenant to let it lie in permanent pasture, but not otherwise.

Mr Brown of Markle, after adhering to the statement of Mr Rennie, observes, that the difference of value betwixt *turf land*, and land kept under convertible husbandry, must vary much, according to soils and other local circumstances; but in such a farm as the one in his possession, he would not have the slightest hesitation of giving 20s. *per Scotch*, or 15s. 8d. *per English acre*, more for land, if freedom of management were allowed, than he would, were the landlord to say, "You must keep it constantly under grass." He farther adds, that he would make the like difference

upon the number of acres proposed to be kept exclusively in grass, whether the number was limited to one-half, one-fourth, or one-eighth of the farm in his possession.

Mr Brown, considering the question as meant to elucidate the superiority of convertible husbandry, further observes, that it is not an easy matter to calculate the difference of produce in twenty-one years, where land is kept under permanent pasture, instead of being broken up and cropped in a regular way, as it is not only the direct loss upon the turf land, but likewise the indirect loss sustained by the arable land, which must be held in view, when that difference is taken into consideration. So far as the question is limited to the quantity of land kept in permanent turf, he would answer generally, that the public loses three furlots of grain, for every stone of beef or mutton that is obtained, by feeding cattle or sheep upon that turf.

Now, under the supposition that equal quantities of wheat, barley, oats, and beans, were cultivated, these three furlots would, according to Winchester measure, be somewhat more than three bushels and three-fourths of a bushel; and their value, at the round average of 50s. per quarter, would be about L.1 : 3 : 6, from which sum falls to be deducted 11s, the estimated value of seed and labour for raising that quantity of grain, leaving a balance of 12s. 6d. as an offset against the value of each stone of beef or mutton obtained by feeding cattle or sheep upon the old turf land. On the other hand, Mr Brown estimates twelve stone of beef or mutton to be a full average of the annual produce *per acre* from old turf, (in a few cases it may be more, but in many others it is less); and as he considers half a guinea *per stone*, avoirdupois weight, to be a higher price for beef or mutton than 50s. per quarter is for grain of all sorts, it follows from these calculations, that L. 1, 4s, sterling *per acre*, is annually lost by adhering to the system

of keeping land exclusively in old turf, independent of the manifest injury done to the old tillage land, from the necessity thereby occasioned of persisting, in consequence thereof, in a similar exclusive system of management.—But taking the question in another point of view, the result is similar. Supposing five quarters of all sorts of grains to be the average of arable crops, and every man who knows the old turfs of England will allow, that a low average is taken, the value thereof at 50s. per quarter is L. 12, 10s. Deduct from that sum L.5 sterling, the estimated value of seed and labour, and L.6, 6s. the value of beef or mutton produced from an acre of turf, there remains a balance of L.1, 4s. sterling in favour of convertible husbandry.—Mr Brown, however, does not contend for constant tillage. He only advocates the cause of convertible husbandry, considering that system to be the best one for promoting the interest of the proprietor, the tenant, and the public.

Artificial grasses, Mr Brown adds, will certainly feed oxen of an ordinary weight, during the period of their growth, and answer equally well for dairy purposes. No doubt there is a period of the year, when young grass will not feed, say from the middle of July to the middle of August, because the first growth has then come to maturity, whilst the second has not commenced; but these things need not hinder the farmer from having a fresh bite of older grass for his cattle, till the season furnishes a fresh supply of artificial grasses. This may be obtained from a field of three or four years old *hained* grass, as well as from a field which has remained in grass for ten times that period.

It is admitted, that a field of perennial grass is beneficial on every farm; though the advantages of such a field, for the stock of breeding ewes in spring, are rather problematical, unless it is regarded as a proper place for giving

them turnips till the grass season arrives. In fact, upon all well-managed farms, where stock and corn husbandry are conjoined, turnips are the chief food given to ewes, in the months of January, February, and March, after which a supply of grass is generally obtained.

The extent of perennial pasture, (not old turf), necessary on a farm of 500 acres, must differ in almost every different situation. In Mr Brown's case, 60 acres answer very well, though with others a greater quantity may be necessary. But this grass, with the exception of a field unfit for ploughing, is regularly broken up by the plough when four years of age, to the great benefit of the rest of the farm; yielding them heavy crops of corn, and requiring little manure for several years.

Mr Hume of East Barns, and Mr Hunter of Tynefield, concur in these observations. They state, that one acre of sown grass will not only in general afford more keep the first year, than can be procured from it the two following years, but also comes much earlier in spring; and that grass, let for pasture at L.7 or L.8 per acre the first year, would rarely give above one half of that rent in the second year. The oat crop, they are likewise of opinion, is not better for the land remaining longer than one year in grass; an opinion generally entertained, unless in cases where the ground remains longer in grass than is consistent with the length of modern leases.

Mr Hood, a most intelligent farmer near Kelso, remarks, that people will think very differently upon the subject of old turf; and before any satisfactory answer can be given, the age of the grass, size of the farm, and the nature of the soil, should be stated; for, upon a small farm, old grass is neither necessary nor profitable; upon a large farm, a small proportion of old grass *may be very convenient*. Upon the whole, however, he does not think it either necessary, or

for the advantage of a farmer, upon a lease of twenty-one years, to keep any part of his land in old grass; nor is he convinced, that it would be for his interest to do so, even upon a lease of longe endurance. The generality of soils, if properly laid down, will produce more grass the first year than they will do in any subsequent one, for ten years at least. He has a field of originally good land, which has been pastured for thirty years, and he is satisfied, that it neither produces more grass, nor feeds better, than it did fifteen years ago; he can see, therefore, no advantage to a tenant, by allowing any part of his farm to remain so long in grass. His opinion regarding old turf, may appear singular in some districts, but it is founded upon experience.

Dr Coventry also is of opinion, that inferior lands should not remain long under pasture. Light, open, sandy, or gravelly soils, or lands full of vegetable mould, may be kept in grass longer than the poorer clayey grounds; and very light lands may, for a time, even improve when under grass; but in the course of three, four, or more years, in consequence of the clay soil sinking down, and becoming over close and cohesive, the commonly cultivated herbage plants, (clover and rye-grass) depart, and the native plants slowly form a sward, which is often, in poor soils, of a bad species, and is never of much value.—If these lands were once put into good condition, and well laid down to grass, they might remain perhaps four or five years in pasture without disadvantage; but even then, a longer period might increase their tenacity, and bring back all the evils arising from over-closeness of texture, producing over-wetness and infertility.

Mr Walker of Mellendean is confident, that no farmer in Roxburghshire, upon a nineteen or twenty-one years' lease, can lay down land, to remain permanently in grass, without being a loser thereby to a very considerable ex-

tent. He does not know what might have been the difference in the weight of his old cattle, had they been fed upon such pastures; but after working them to the month of August, and continuing them on pastures of one and two years' old, while there was grass in the fields, he has sometimes sold them in the spring following, at the weight of 120 stones English, and his wedders and draft ewes generally average about 20lb. English *per quarter*.

Mr John Shirreff forcibly refutes the arguments used in favour of old turf. He states, that new pastures are much fitter for sheep than old, because they are much earlier in spring, and much more vivid and fresh during the winter months. It is admitted, he observes, by some of the most strenuous advocates for old turf, that clover and rye-grass has at least a fortnight's start of old pasture in spring; though it will often actually have near a month's, on similar soil, in the same situation, whether both have been eaten, or both saved during the preceding winter, unless the clover have been eaten so close as to injure the plants. This, he observes, is a circumstance of the greatest moment, as the salvation or destruction of a flock may depend on a few days keep, instead of a fortnight's, at that critical season of the year, the spring months.

In regard to the cattle fed on old turf, he maintains, that very large oxen are but unprofitable stock, in most situations, and always easier and cheaper fed at the stall, than in the pasture field; also, that it is contrary to a farmer's interest, either to breed, or feed cattle so heavy, that they cannot pasture at their ease on any land, but the soft carpet of an old turf field. As to giving turnip to stock ewes in spring, previous to dropping their lambs, he contends, that pasture of two years standing, or even what had been pastured for one season only, namely, the year immediately preceding, will equally well answer that purpose, as old

turf will. Moreover, that drawing turnip, and giving them to sheep, or any other stock on old turf, *never broken up, as recommended by the friends to that system, is cheating the rest of a farm of manure, and occasions a heavy loss, as this old turf does not carry grain crops, turnips, &c. as it would do, if under convertible husbandry, and so return its due proportion of manure to the other fields of the farm, while it allowed them to be refreshed with pasture in their turn.*

As to the objection, that in seasons extremely dry, the grass on convertible land is burnt up, he alleges, that if land be well prepared, and laid down with plenty of good seed, particularly white clover, and be not too hard stocked, that is, too close eaten down, early in the season, clover and rye-grass will bear nearly as much drought on the same, or similar land, as old turf will; at least he ventures to think, that when a field of good clover and rye-grass is burnt up, old turf, on similar soil, will at least be singed. In an extremity, some oats or barley might be cut green, to carry on stock till rain restored vegetation. And he thinks, a very small sacrifice of this sort, would bring good clover and rye-grass to the *par* of old turf, on the only occasion on which they do not rank above it in this country, for any really useful, profitable, known purpose, to which either species of produce can perhaps be applied.

In regard to the variety of grasses in old turf, Mr Shirreff observes, that this mixture is a palpable loss. There is, thus, a quantity of the rotten herbage of noxious and rejected plants, always mingled with the fresh and edible, which certainly can neither be so palatable, safe and nutritive to the stock, or so economical in consumption, as when a few plants only are cultivated, which are *known* to be grateful, salubrious, and nourishing to the animals intended to consume them, and which consequently make no waste in doing so. And this is perhaps the reason, that new pastures are

in general more equally eaten than old. Where noxious or rejected plants abound, we find the herbage rank and little touched, while particular parts of the field, free of this trash, are eaten to the bone.

Mr Shirreff adds, that there are few, if any, of the plants which constitute the cultivated herbage of the Scottish husbandry, which do not spring again immediately, and vigorously, as soon as cut or cropped over, provided they be not allowed to run to, or towards full bloom ; or, which is still worse, to form seeds. The case is different with many of the plants in old turf, several of which are puny, and also slow of growth. Some have a short paroxysm, as the *cinosurus cristatus*, which, when the stem and panicle withers, stands an unsightly object the whole autumn, and even winter after ; and being as tough as wire, must annoy the cattle in mouthing the fresh herbage with which it is mixed.

Many plants, which are found in all old turf, are rejected by cattle, sheep, and horses ; as the common daisy, (*bellis perennis*) common crow-foot, (*ranunculus repens*) &c. This last indeed, when in seed, is so pungent, that were any considerable quantity of it taken into the stomach of an animal, violent inflammation and death would inevitably follow ; and, probably, many cows that are said to be witched, or die of the woad-ill, &c. may suffer from this very plant. He farther asserts, that old turf is full of various fungi or mushrooms, many of which are deleterious, and some of them, when taken into the stomachs of animals, the most deadly vegetable poisons in nature.

Ragwort (*senecio Jacobae*) is *only* eaten by *sheep* when it is very young. This is a plant that covers many old turf fields. The meadow-sweet (*ulmaria*) is a beautiful, fragrant plant, common in old meadows, if inclined to peat : but horses and cows reject it ; sheep will eat it.

On the whole, Mr Shirreff is satisfied from experience

and observation, that, admitting always that the soil and climate is nearly the same, a field of clover and rye-grass well laid down, will, on the average of the two first years, keep, or feed, more stock, than one of old turf, of the same extent will do, in the same years ; and as the flush of herbage of the clover, &c. will be much earlier as well as greater, more profit must be derived from its consumption.

One of the principal disadvantages of old grass lands, kept for hay, and occasionally pastured, is the quantity of manure that is wasted in top-dressing them. There can hardly be a question, that dung should be covered with earth, so as to derive the full benefit from it. How absurd then must not the practice be, of laying such quantities of rotten dung on the surface of grass land, so frequently the case in England ! Dr Coventry most justly condemns this practice, as the bane of good husbandry, though it is necessary to follow it where the exclusive grass system is maintained: He observes, that there must always be great waste, wherever putrescent manure is spread on the surface, instead of being covered in by a portion of the soil. In the decomposition of putrescent matter, every one must be sensible of the ascent of a part of the materials. Animal and vegetable substances, if exposed to the atmosphere in a putrifying state, will almost entirely disappear. The loss may be greater or less in different cases ; but every hour the manure lies spread on the surface of the ground, it must of necessity suffer waste. On the contrary, if ploughed in towards the end of a summer-fallow, or with a horse-hoed crop, it will be most effectually blended with and covered in by the soil, and all that essential part which, becoming volatile, is dissipated into the atmosphere, will be retained for the nutriment of the after crops *.

* There is no instance in Berwickshire, where the farmer is bound to

It may be observed, as an additional proof in favour of the convertible system, that though in East-Lothian the meadow lands are all converted into arable land, and there is hardly any portion of natural grass, yet, as Mr Curwen remarks, the rents paid in that county are higher than in any part of Great Britain, and have been progressively increasing ever since that system was established. Hitherto, therefore, no deterioration of the soil has been felt, which, after such a period, may fairly be taken as conclusive, that the soil, so managed, will yield at all times with equal productiveness.

Being anxious to bring this important subject to the test of calculation, I prevailed upon some of my farming correspondents, to direct their attention to this mode of investigation; and Mr Thomson of Bewlie, in Roxburghshire, having stated it as his opinion, that though old grass, if let at a moderate rent, might be of some advantage, yet that no farmer could afford to pay as much rent for land in grass, as he could do, under the alternate husbandry of white and green crops, I was thence induced to enquire, what would be the fair difference of rent, if one-eighth part of a farm of 500 acres were kept in permanent pasture, compared to the rent that could be paid for the rest of the farm? Mr Thomson's answer is, "I think that the rent ought to be

manure his grass land; perhaps the most injurious system that could be devised in a tillage or arable district. Of this practice, as a system in husbandry, there is hitherto no experience in Scotland, where there does not exist that vast demand for hay, which claims such extraordinary protection for meadows in some parts of England; neither is meadow or old grass land hay so much in repute in Scotland. Round gentlemen's residences, perennial grass land is occasionally mown, for supplying hay to their own stables. But sufficient rest and recruit is always allowed, by several years pasturage, to repair any waste of fertility that may have been occasioned by the hay crop. See *Kerr's Berwickshire*, p. 136.

one-third less per acre than the rest of the farm." According to this doctrine, if a farm of 500 acres was worth L.2 per acre, one-eighth part thereof, or $62\frac{1}{2}$ acres, would only be worth L.1 : 6 : 8 per acre; the difference being 13s. 4d. per acre, would amount, on $62\frac{1}{2}$ acres, to L.41 : 13 : 4, which, on a lease of twenty-one years, would be a loss to the landlord of L.875, besides periodical interest.

But that is nothing, compared to the detriment sustained by the public, when land, fit for the convertible system of husbandry, is retained in permanent pasture. The following is the calculation made by Mr Thomson, of the difference in the value of the produce of the two systems, in the course of a lease of twenty-one years.

Produce of an acre for four years, cropped according to the four-course shift husbandry, and as applicable to the soil and climate of the district in which Mr Thomson's farm is situated, namely, the upper part of Roxburghshire.

1. Turnips, value of crop.....	L.5 0 0
2. Wheat, value of ditto.....	10 0 0
3. Grass, value of ditto.....	3 10 0
4. Potatoo oats, value of ditto.....	7 10 0
	—
	L.26 0 0
To expences for ploughing, sowing and hoeing turnips.....	L.1 15 0
To ploughing, sowing, harvesting, &c. the wheat.....	2 15 0
To grass seeds.....	0 12 0
To ploughing, sowing, cutting, &c. oats, 2 0 0	—
	L.7 2 0
	—

Value of produce for four years,.....	L.18	18	0
		5	
Twenty years,.....	L.94	10	0
One year,.....	4	14	6

Produce of one acre for 21 years,.....L.99 4 6

The produce of two acres in old grass, for 21 years, will feed five sheep *per annum*, leaving a profit of 15s. each, that is, L.1 : 17 : 6, *per acre per annum*, which for twenty-one years, (on the principle on which the profit on the turnips should be stated), amounts to *.....L.39 7. 6.

Balance *per acre*, in favour of the convertible system of husbandry,.....L.59 17 0

* On this subject, Mr Trevelyn of Nether Witton, remarks, that a real good pasture, will carry and feed four Southdown sheep *per acre*, the fleece alone of which is worth seven shillings, and if turnips are given the sheep in the winter, the calculation is five sheep *per acre*; from the profit of which, however, the expence of the turnips is to be deducted. Another zealous friend to old turf observes, that the species of land to be continued in old grass, seems not to be properly understood; land that would only keep two and a half sheep *per acre*, and the profit of these only 15s. *per sheep*, is not the soil for which the warmest advocates in favour of old grass would contend. The soils that are generally found most advantageous to keep in permanent grass, are strong loams, or clayey soils, improper for turnips, and which improve the longer they are kept and depastured in grass; such lands as will carry six or seven sheep *per acre* through the summer, and one and a half, or two sheep of the store flock, through the winter. Upon farms of clayey soils, it is contended; that a breeding ewe flock could not be kept without a certain portion of old grass land, and soils of this description are in much greater proportion than turnip soils. But where land will keep more sheep

But if it were admitted, to obviate any objection to these calculations, that the profit of a sheep *per annum*, including the fleece, is 21s. each, yet still the balance *per acre*, during a lease of twenty-one years, would be L.44, 2s. which sum, according to the above statement, may be placed to the credit of convertible husbandry.

On a farm of 500 acres, let for twenty-one years, the loss of value in produce, would therefore amount to the enormous sum of L.29,925, in the one case, and L.22,050 in the other; and where the land was more valuable, the loss both of rent and of produce would be still more than the sums above calculated.

It may be observed, that the straw produced on the farm, and the turnips, when eat off by sheep, will fully answer all demands for dung that is wanted by the farmer.

Mr Thomson's system of retaining a part of his land in grass, for four or five years, and then throwing it again into the rotation, has already been described, in the Section of Rotations, under the head of Double Rotations.

Mr Brown of Markle, some of whose calculations, respecting the profits of convertible husbandry, upon soils such as those of his own farm, (which are chiefly of a clayey nature) have been already noticed, has also favoured me with his sentiments upon the same subject, as applicable to soils naturally qualified for carrying turnips. According to the views he has taken of the question, it appears, that were old grass land, calculated for turnips, to be broken up by the plough, and brought under a regular course of husbandry, the quantity of live stock which might be fed upon turnips and clover, during a six-course shift, of turnips, bar-

than Mr Thomson calculates, the arable crops will be proportionally more productive.

ley, clover, oats, beans, and wheat, would not be much inferior to what is fed at present upon these lands, whilst they are exclusively kept in a state of pasture. But, allowing the bean crop to make up for that deficiency, he considers the disposable produce of the other three corn crops, that is, what remains after the home consumption is supplied, as an entire acquisition to the national stock, and he estimates the value of that disposable produce at L.21, or L.3, 10s. upon each acre of land, regularly cropped and cultivated, according to the rotation above mentioned. Hence, it appears, that a sum not less than L.73, 10s. sterling, is lost during a twenty-one years' lease, upon every acre of land, naturally qualified for carrying turnips and clover, that is retained as old turf, or kept in a state of permanent pasture,—a sum which exceeds the fee-simple value of many of these lands, were they brought to the hammer, and exposed to sale by public auction.

These doctrines are amply confirmed by the calculations of Mr Murray of Kirkland-hill, who makes the following statement of the produce of lands in cultivation, compared with lands in permanent pasture :

	<i>Produce per annum.</i>
100 acres in fallow and wheat.....	L.1000 0 0
100 acres in oats and clover.....	1125 0 0
100 acres in beans and wheat.....	1500 0 0
<hr/>	
Divide by 3)	3625 0 0
<hr/>	
Average produce <i>per 100 acres</i>	1208 6 8
Produce of 100 acres in permanent pasture, at L.3, 10s. <i>per acre, per annum</i>	350 0 0
<hr/>	
Difference in value of produce <i>per 100 acres</i> , L.	858 6 8
<hr/>	

*Loss in produce, per acre, per annum, by
neglecting convertible husbandry.....L.8 12 6*

From the above sum, however, the expences of cultivation are to be deducted ; and if it were admitted, that such expences may, in some cases, amount to even 50 per cent, of the gross produce, a deduction to that extent would reduce the loss, from neglecting convertible husbandry, to L.4 : 6 : 3 per Scotch, or L.3, 9s. per English acre.

I do not recollect any agricultural subject, where the arguments on both sides are more fully stated, than in the preceding extracts from the communications which I have received from so many intelligent correspondents ; and it is with great diffidence, that I venture to submit to the reader's consideration, what seems to me the result of the whole investigation.

1. I certainly think, that it is highly desirable to keep one or two moderate-sized inclosures, containing from 10 to 20 acres, according to the size of the farm, near the residence of the farmer, in grass, for the feeding of cattle and sheep, provided the soil be naturally calculated for it, or is thoroughly drained, and improved by manure and cultivation. The utility of this measure is acknowledged by almost every one of my numerous correspondents, without admitting at the same time, that such field or fields should never be broken up, or that the same part of the farm should always remain in grass *.

* An intelligent correspondent is inclined to go farther. He contends, that the utility of rich old pastures, depends in a great degree on the management which the farmer, in his particular situation, finds most profitable ; though the general advantage requires, that alternate husbandry should be preferred to permanent pasture. That wherever cattle

2. Where the finer sorts of sheep are bred, it is contended, that it is necessary to have some old turf, where the ewes may drop their lambs, and where they may be fed with turnips, or any other article in the spring season. But old turf is quite unnecessary for either of those purposes; Mr Rennie of Phantassie, and Mr Brown of Markle, having ascertained by experience, that on dry land, which is the only proper kind of soil for ewes to lamb upon, grass of two or three years old is as good as that of twenty.

3. It is likewise contended, that it is necessary to have some old turf, as a recourse for the stock to go on, in case of any spring or summer uncommonly dry, such as happened in the year 1810, when it was a long time before the artificial grasses made their appearance, or could be either cut or pastured. On loams, however, artificial grass may always be pastured earlier than old turf, unless in seasons when uncommon wet weather prevails; and other substitutes have been already suggested.

4. Lands apt to be overflowed, or which have been converted into water-meadow, it is evident, cannot be cultivated for grain crops; and there may be *some very rich old meadows*, which it would be desirable to preserve in the dairy districts *; but with these exceptions, there seems to be no doubt of the infinite superiority of the convertible husbandry, to the landlord, the tenant, and the public; and

and sheep are reared and fattened, a certain proportion of rich old grass cannot well be dispensed with; and so long as it continues productive, it should not be subjected to the plough, especially if the soil is clay, or moist soft loam.

* Many would go farther in regard to the preservation of old meadows, thinking it a pity to touch them on any account. It has been ingeniously remarked, that a similar reason might be given for continuing to plough with four horses, that it would be a pity to spoil so pretty a team.

it can hardly be questioned, that there are many hundred thousand acres in England, now in permanent pasture, which might be advantageously subjected to that system. Old grass lands also may be broken up, and if judiciously and moderately cropped, may be laid down again in grass without loss *. Indeed Mr Shirreff observes, that where calcareous matter has not previously been applied to such lands, he has no doubt, that with the assistance of that most powerful substance, both the quantity and quality of their herbage would be much improved.

It is ascertained by experience, that by feeding sheep with turnips on old grass, a perpetual crop of hay may be obtained, without injury to the land thus treated, by giving to the sheep, the produce of as many acres of turnips, as the grass field consists of. The land, of course, receives their droppings, which never fails to raise a good crop of hay. This plan, however, is objected to on various grounds. It is in particular observed, that though eating drawn turnip on old pasture grass, very much improves the quality of the herbage, by the droppings and urine of the sheep stock, as well as by the effects of compression from treading, which destroys the tribe of musci, and encourages the growth of trefoil or white clover, and also of any of the finer species of the perennial grasses which may have possession; yet that such a plan can only be adopted, as the means of restoring the beauty and luxuriance of a *favourite field of pasture*, (for instance a lawn, or gentleman's park), and not as a *profitable mode of consuming turnip*; for the succeeding crop of hay, will exhaust the fertilizing effects of the

* It has often occurred to me, that much land, under permanent pasture in England, might be applied to the production of lucern, the most valuable of the grass tribe.

sheep manure. Were the field on which the turnips are eaten, broken up for oats, to be followed by turnip, a grain crop, then clover, &c. more justice would be done to a farm in *general*, and more valuable produce raised. Mr Mitchell of Balquharn likewise observes, that the above mode of obtaining a crop of natural hay, must be greatly to the injury of the arable parts of a farm. In situations where dung cannot be purchased, he is fully persuaded, that every acre of good turnip, consumed in straw yards, or in *byres* (cow-houses), adds to the value of a farmer's dunghill L.6 sterling.

Suppose 250 stones, at 7d. (being inferior to clover and rye-grass hay), the value would be.....	L.7	5	10
Deduct, for expence of making, and all other charges.....	1	5	10
	<hr/>		
	L.6	0	0

Thus the produce would only pay the manure yearly bestowed on it.

It is remarked also, that these droppings of the sheep, would produce a crop of wheat, which would be a much better and more profitable application; and that it is a most exceptionable practice, to apply manure in any way, for the purpose of raising hay from the grass land, at the expence of the arable.

In regard to the breaking up of land, and laying it down again to grass, I have already given my sentiments at large, in a paper to the Board of Agriculture *. Mr Logan is of opinion, that the best method of breaking up old grass land, where it is supposed grubs may injure the crop intend-

* See Communication to the Board of Agriculture, vol. iii. p. 6.

ed to be sown, is to lime on the sward, after being very bare eaten, at the rate of 25 or 30 balls of shells *per acre*, and then to have a thin furrow before the winter: the lime and frost will destroy the grub, and make the land harrow well *. Mr Trevelyan of Nether Witton, however, strongly recommends paring and burning, as the most effectual means of destroying all the variety of grubs with which old pastures abound. If lime be cheap, 100 balls *per acre* may assist in the destruction of grubs, and will insure an abundant crop of turnips, if the land be suitable; but liming alone, he thinks, will not destroy the grub effectually. Many farmers prefer breaking up land with the plough, during the winter, for a crop of oats in the spring; beans next, and then wheat or oats, if the land is of that quality to stand it; but if not, oats, turnips, barley, and clover. Others contend, that a good crop of beans is seldom or ever raised after oats from old pasture, although the occupation of the land in grass has not exceeded three or four years, except the soil is a tender deep loam.

As to laying down strong land (that is to say, soil on a clay bottom) to grass, Mr Logan advises, and indeed, has found it the best and most profitable plan, after summer fallowing, and manuring the land with lime and dung, to ridge it up for the winter, and to sow it with barley in the spring upon a fresh furrow, by which system, a good crop of barley, and a plentiful growth of grass, may be obtained; whereas, when wheat is sown in the autumn on fallow, the land gets so hard during the winter and spring, that the grass-seeds cannot be sufficiently harrowed in,

* It would appear from Mr John Shirreff's remarks, in the Appendix, that lime has not the effect of destroying grubs effectually.

without pulling up a great deal of the wheat, by which means, the seeds are not covered, they do not vegetate equally, and some not at all; and the land always has a hardness when in grass, which it loses by the spring working for barley; after barley, the land is always more mellow, and the seeds vegetate more kindly.

When old pastures are broken up, if the soil is good, there can be no doubt, that they might be replaced in a more productive state than ever, and much profit got, by adopting the following rotation: 1. Oats; 2. Summer-fallow with lime; 3. Wheat; 4. Drilled Beans with dung; 5. Wheat; 6. Drilled Beans; 7. Wheat; 8. Summer-fallow with dung; and, 9. Wheat and grass-seeds.

On the whole, it appears, that the retaining of any considerable portion of a farm in old turf, or permanent pasture, is, in general, injurious to the landlord, the tenant, and the public; nor can any system be more absurd, than to bind a tenant, to lay on his grass land the greatest proportion of the manure produced on his farm, and to reserve but a moderate quantity for his *arable*. Under such a system, it is no wonder that the meadows should improve, whilst the arable must necessarily be deteriorated. How easy would it not be, to double the value of any estate, where the system of permanent pasture is carried to unreasonable extent, by appropriating the manure of the farm, to turnips and other green crops, and by the adoption of the convertible system of husbandry?

SECT. XIII.—*On Haymaking.*

IN Scotland, in general, the farmers are not so attentive to the making of hay, as they are to the culture of corn crops. It is often allowed to stand too long uncut, for the sake of the seed, which is a very pernicious practice; and after the crop is cut, many farmers suffer it to lie on the ground, as the scythe left it, for ten, twelve, or more days, when often the side next the ground is damaged, and discoloured, the upper side over withered, and the fine juices of the hay evaporated, being often literally bleached with sun and rain, like flax; by which means much of the substance is lost. In a great many instances, after being ricked, it remains on the field for many weeks, when it receives much damage, often from rain, and the too long exposure to the atmosphere of the surface of so many ricks; and a great space of land is also damaged by the long continuance of the hay upon the ground. In some instances, hay-stacks are not sufficiently thatched to keep out the winter rain and snow; and the consequence often is, that the rains penetrate, and even sink deep into the stack, by which the hay is damaged.

The following improvements, in regard to the management of hay, are recommended from several respectable quarters. 1. After the grass has arrived at its full growth, but before the seed is formed *, it should be cut down; by

* No herbage, Mr Shirreff remarks, should be allowed to form seed.

this means the full juice and strength of the plants will remain in the crop. 2. What is meant for hay, ought never to be threshed, for there is no strength or substance in threshed hay; but wherever seed is wanted, a particular part of the field should be reserved for the purpose of furnishing it. 3. After the hay is cut down, Mr John Shirreff recommends, that it should not be roasted or over-dried in the sun, but cocked as soon as the state of the herbage will admit of it, for reasons to be afterwards explained. He knows at the same time, from experience, that there are few seasons in Scotland, where it is possible to rick clover immediately after the scythe. There is almost always, in this northern climate, a dew or dampness, on a luxuriant crop of red clover, fit to be mowed, even in the finest weather, till the afternoon. It is impossible to get mowers to sacrifice half their time to the convenience of another, and it is impossible to get rid of this dampness, but by turning, or even in some cases tedding, or rather spreading it out. 4. After it has been a short time in small cocks, it ought to be put into what are called tramp-ricks; and this to be done in a fine sunny day. The sun and air gradually win it, and, if the weather is favourable, it may, in ten or twelve days, be put up in the stack, after which it ought to be immediately well thatched. In rainy weather, it may be difficult to prevent hay from being somewhat damaged; but much may be done, by embracing every fair day to turn the hay, or spreading out the small ricks, and putting them up carefully in the evening. After it is in the tramp-rick, it may be said to be safe, unless the rain continues long; and whenever it is thought to be in such a dry state as to keep, no time should be lost to put it into the stack:

When seed is formed and saved, the stems are literally straw, and the soil is injured, in proportion to the advanced state of the plant.

Dr Anderson, in his Essays on Agriculture, has given several useful directions for making hay from artificial grasses, which have been practised with much success. According to his system, the hay ought to be tedded as little as possible *, as the leaves of red clover, in a rainy day, are so brittle, that they break off, and are lost. It is better to turn the swathe over as whole as possible †.

Mr Stewart of Hillside, also thinks, that most of the ill-

* Clover and rye-grass hay, ought never, in ordinary seasons, to be tedded, but turned over without breaking the swathe. The ricks should be placed upon the middle of 3 or 5 ridges, to which the hay should be carried, each carrier followed by a raker; and not, as formerly, tossed together into windrows, and driven by the rake to the ridge on which it is to be cocked.

† The form of the rick is a point of great moment in haymaking. In Wensley-dale, in Yorkshire, they seldom make long ricks, but round ones, nearly cylindrical, till they are about two-thirds of its height, when a conical form takes place; the rick is then carried up to so regular a point, and roped so closely and nicely, that neither wind nor water can penetrate. In short, the ricks thus formed, are less injured by time or tempests, than those that are covered with straw, which is the common practice in most counties.‡. The reason is obvious, because the stacks that are covered with straw, are seldom carried regularly to a top; they are generally too broad there, and the straw is then laid on very injudiciously, and without method; the rick consequently in time takes water, and a considerable part of it becomes putrified litter. By the carelessness of servants, and the want of a judicious and philosophical knowledge in most farmers, respecting the figure and finishing of ricks, their losses cannot but be considerable. The true figure of what is generally called a round stack or rick, is at the bottom part the lower frustum of a spheroid; nearly at the middle, the diameter is about one-eighth greater; then it is gradually raised, and finished in a neat conical manner.

‡ It is said, that if the ricks are equally well built, thatching with straw must be preferable. But, on the other hand, it is contended, that if straw is at all admitted, the tops will be carelessly done, as its defects will be concealed.

got hay, in rainy showery weather, is owing to its being worked too much. For thirty years, he has persevered in the following system with uniform success: If the hay lies untouched in the swathe from 24 to 48 hours, it is turned over as round as it will lie, but so open, as the wind, if any, will blow through it. If the weather is dry, it is turned again the third morning, and is very often that day put up in tramped ricks of about 30 or 40 stones each. If the weather is showery, the hay is treated nearly in the same manner; but if the rain is constant and heavy, and the swathe clapt to the ground, they are turned over to prevent their growing yellow, and continued to be turned over for that purpose while wet or for drying, when the hour answers, but are never spread out. The more surface exposed, the more sap is lost in the dry hour, and the easier wet in the shower. The operation of gathering and raking from the swathe is less than when spread.

Dr Coventry has published some judicious observations on haymaking, in his Treatise on Live Stock, printed anno 1806; the substance of a part of which, it may be proper to submit to the reader's consideration.

The cultivated herbage in Scotland, he remarks, which is generally composed of rye-grass and red clover, with small proportions of other species, as white clover, yellow clover, rib-grass, &c. should be cut *much more early than it commonly is*, especially if it abounds with a great proportion of the first-mentioned species. It matters nothing, though many stablers and grooms prefer rye-grass, so far advanced as to have its seed mostly ripe; for as the horses under their charge usually receive, at the same time, a good allowance of corn, the hay does often perhaps little more than divide the other food, bear bulk, and comfortably fill the stomach. Such hard fodder is reckoned a more lasting bait: and certainly it is, if one shall judge by the time

required to eat it, and perhaps to digest it, and not by the time it supports the animal, or the degree of nutriment it contains. Grooms having the refuse seed as a perquisite, are sometimes led to prefer the ripened produce, from motives which overmatch their virtue * : a ton of ripe rye-grass hay, has frequently yielded a quantity of seed worth 30 per cent. of its own price. For the husbandman, however, it is of great consequence to be aware, that the under-ripe grass is, for his purpose, by far the most valuable ; a fact not so generally understood, or attended to, as it ought to be. Old stale rye-grass, made into hay, is not greatly superior to the straw of corn ; while the young herbage, so prepared, is very fattening—a thing quite analogous to what takes place with several other sorts of vegetable produce.—The stems and footstalks of the leaves of many plants, as cole-worts, cauliflower, asparagus, &c. which afterwards harden into a stringy, dry, hard, or insoluble substance, is originally a soft, nutritious mucilage. Another instance, shewing the advantage of cutting herbage of different sorts in its early state, occurs in the case of pigs †, fed on clover, rye, and buck-wheat, (*polygonum fagopyrum*), they thrive on these articles, particularly clover, if cut sufficiently early, i. e. when considerably moist and succulent. But after the flowering period, and even long before the seed is ripe, much of the produce is rejected by them ; or if they are obliged to use it, they pine over it, or make small progress ;

* Mr John Shirreff remarks, that not only grooms, but stablers who take horses at livery, prefer wiry hay ; for two reasons, 1. Horses eat less of it, and, 2. The seed it yields puts money in their pockets. The fault lies with the consumers. Let them put a *proper value* on fine, fragrant, delicate hay, and the farmers of Scotland will soon supply it. Till then, it is not for their interest to do so.

† The same observation may be extended to horses and cattle.

and such an application of the vegetable produce becomes then not economical. Indeed all gramineous and other plants, given as food to cattle, should be cut, in a duly young, but not in a very young state. The difference in the value of the hay, from rye-grass, &c. produced in one district, compared to another, would appear to be principally owing to the plants, in one situation, being less ripe and hard, when mown, than in others. Cultivators in different quarters, are not uniform in their mode of practice as to this matter. The conduct of some, however, in respect to the early cutting, and the careful and speedy drying and securing of their hay, is commendable.

Besides these considerations, several advantages attend an early cutting. It contributes to preserve the plants in vigour, not only for the after part of the same season, but for succeeding seasons and crops, and it retains them in the ground longer than they would otherwise continue. Most gramineous plants, which have been long under culture, seem little capable of recovering themselves, when they are cut down only after their stalks are full grown. In every species of corn, and in the annual grasses, (of which description rye-grass, probably, has a tendency to become, after some years' cultivation in certain grounds), when the seed is filling, the entire plant becomes somewhat hard and dry; then fewer and feebler buds spring, to form new roots and stems, and at length the dwindling produce ceases to survive.

Mr John Shirreff has remarked, that if it were possible to make any considerable quantity of hay, under an actual shed, there could be no doubt of obtaining it of superior quality to that made in the sun. If the herbage be dried altogether in the sun, so as to be in no danger of spoiling afterwards, then natural juices, instead of being condensed and inspissated in the ligneous matter of the herbage, would

be exhaled by the sun into the atmosphere, and would leave nothing but the meanest straw. The flavour of grain, and its straw, when put into sheaves immediately after being cut, is very different from, and superior to, in colour and smell, that which has been allowed to lie exposed to the atmosphere for one night, or even a few hours, especially of hot sun-shine, or damp weather, after being reaped; and the middle of the sheaf of grain, thus treated, is invariably the fairest and sweetest grain, and the straw of that part of the sheaf the finest.

The whole art of haymaking, as Mr Shirreff justly observes, resolves it self into two parts: 1. Cutting early; and, 2. Drying the herbage as much as possible in the shade.

In regard to the first point, he insists, the more luxuriant the plant, and the quicker its growth, the more succulent, fragrant, finer, and consequently the more nutritious and valuable, will be its herbage, in a young state, whether green or dried. Nature and principles are the same everywhere, and the same results will follow from *haying*, (if that expression may be more generally applied than it commonly is); the tea plant of the East; the tobacco of America; and the clover and other herbage of Great Britain, or of any other European country.

As to the second point, Mr Shirreff defines hay, properly speaking, to be, the juice of plants or herbage dried "in the leafy and fibrous part of that herbage." It is not, therefore, he maintains, the fibrous matter, palpable to the touch, that constitutes *any part of the hay*; it is the insipidated juice, condensed in the dried fibrous matter of the herbage, that really constitutes that article. In order that those juices may be preserved in their greatest abundance and perfection, it is essential, that the herbage in which they are contained, should be dried as much *in the shade* as is consistent with the expence attending that mode of

curing. By drying herbage for hay in the shade, is meant cooking or ricking that herbage. The outer exposed surface is always bleached and insipid. That which is below, and *in the shade*, is grateful to the palate, and fragrant to the smell *.

Mr Shirreff further adds, that if the inspissated juices of dried herbage, be extracted by infusion from the fibrous matter, the hay passes into the infusion, and the fibrous matter itself is nothing but the straw of the plant. Hence *hay tea*, given to calves, is a nourishing diet, whilst the fibrous matter that remains is of no value.

These observations seem to me so just, that I was glad to find, that a plan had been adopted by Mr Church of Hitchill, by which such important objects might be obtained. It was originally practised in Lancashire, where it is called *tippling*, and is carried on with great success; and Mr Church has ascertained, that it may be executed in Scotland with equal advantage. He considers it to be not only a cheap, but a superior mode of making hay, more especially in precarious seasons, or for making a second crop of clover. It is proper to make the *tipple* as soon as the grass is mown, if dry; if not, it is better to wait till it is so. If the crop is strong, there is a row of tipple placed on each swathe; if light, two of these are put into one row. In making one, a person with the right hand rolls the swathe inward, until he has a little bunch, then the same is done by the left, until both meet and form 8 to 12lb. weight or thereabouts. This bundle is set

* Nothing can be more absurd, on this principle, than exposing cut grass too much to the sun. The sooner it is shaded, by being put in cocks and ricks, from the influence of the sun, so much the better; for by the heat and influence of the sun, not only are the aqueous particles evaporated, but the most valuable substance of the grass is destroyed.

up on end against the legs or between the feet. A rope is twisted of the grass, while the bundle is supported in this manner, which is tied round the bundle near the top of it ; and from the top are drawn up a few straggling stems, which are twisted, to make the tipple taper into a point, and give it as much a conical shape as possible. After standing a few hours, they become so smooth on the outside, that the heaviest rains seldom wet them through, and when wet they are soon dried again. As soon as ready, they are put into the summer rick, or even the winter stack, if very dry ; but are never opened out, or ted, to make them dry, as they never require it. By this method not a leaf is lost, and the hay is nearly as green as a leaf dried in a book. In a moderate crop, one woman will tipple to one mower, and a woman will rake to two tipplers or two swathers. But where the crop is strong, it may require three women to keep pace with two mowers. After the hay is put up in this manner, the crop may be considered as secure, though it may continue wet weather for a considerable length of time. A neighbour of Mr Church's was induced to make his hay, in consequence of the directions for *tippling* given in the first edition of this work, which he perfectly understood, and he approves most highly of it. In short, Mr Church considers it to be the best and cheapest mode of making hay from artificial grasses, more especially if the crop is heavy, and the weather precarious.

Besides this plan of Mr Church's, another has been found to answer exceedingly well. The grass is gathered into small bunches, but instead of being set up on an end, the straggling stalks are folded downwards, as a support for the bunch, which in this way rests upon the doubling of the ends, admitting the air beneath it, and being raised above the dampness of the soil. It has a hanging position,

like the roof of a house, and by this mode, the hay is saved remarkably green and fragrant for the field rick, to which it may be carried in a few days.

Among other reasons for paying particular attention to the making of hay, one is not likely to be controverted, namely, that there is no sort of feeding which requires a larger portion of land, and is more expensive for cattle ; it is necessary, therefore, to improve its quality as much as possible, and to economise in regard to its consumption. To feed with hay from October to June, would cost, at a shilling *per stone*, at least from L.10 to L.12 *per beast* ; whereas straw and turnips could not be estimated at a third part of that sum, and would answer as well. In the Appendix, will be found some hints for a more economical mode of feeding horses ; by means of which, not only less corn, but less hay will be necessary.

General Remarks.

I HAVE thus laid before the reader the substance of the numerous communications transmitted to me, regarding the practical details of the Scotch System of Husbandry ; which I trust will be found to contain a number of valuable hints, and more minute information, regarding some particular points, than hitherto has been communicated to the public.

The Author has always been of opinion, that however mysterious the art of agriculture may have formerly been considered, yet that now, it might be reduced to a few simple principles, and, in regard to several particulars, brought to almost mathematical precision. The reason why that has not

hitherto been effected, to the extent of which the subject was capable, is, either that real practical men have rarely published the result of their experience and observations on agricultural questions, or that those who have written their sentiments, have seldom entered sufficiently into detail, so as to explain those minute operations, on the due execution of which its success must in a great measure depend. Besides, it is only within these few years that a judicious and economical system of agriculture has been extensively carried into practice, or the principles on which it ought to be conducted, thoroughly ascertained. By the improvements, however, lately introduced into that art, (which the minute enquiries carried on under the auspices of the Board of Agriculture have fortunately brought to light), the principles are at last established, on which the territory of any country, at least of one possessing a soil and climate similar to Great Britain, may be cultivated with profit and success.

I trust, that the preceding details will contribute to the elucidation of this most important subject ; in which case, the attention bestowed in collecting materials for this work, and the preparing it for publication, will be most amply compensated.

CONCLUSION OF PART I.

It may be proper to conclude this extensive enquiry, by, 1. Giving a general view of the improved System of Husbandry established in Scotland; 2. Pointing out the improvements of which it is still susceptible; and, 3. Explaining the means by which that system can be best disseminated in the less improved districts of England, of Scotland, and of Ireland; where, from its simplicity and productiveness, joined to the economy with which it is carried on, it may be introduced with great public and private advantage.

Sectr. I.—General View of the Improved Husbandry of Scotland.

IN a communication from my respectable friend, Sir Joseph Banks, he stated, that “agriculture has derived, is “deriving, and will derive, more benefit from Scotch in-“dustry and skill, than has been accumulated since the “days when Adam first wielded the spade.”

I hope, that the following general view of the improved System of Husbandry, as established in Scotland, will justify that observation.

The foundation of improved agriculture is certainly laid, in the best cultivated districts of Scotland, in as great perfection as it possibly can be in any country. The farms are usually of a proper size;—the farmers, in general, have capitals adequate to their cultivation;—they are bound to pay the landlord such a proportion of the value of the produce, as renders it necessary for them to be industrious and economical, and to acquire all the skill, in the art of husbandry, to which they can have access;—their leases are commonly of such a duration, as to encourage judicious expenditure in the improvement of their lands, with the prospect of an adequate return;—the covenants contained in their leases are sufficiently fair, being almost, in every case, well calculated to promote, and not to retard improvement;—a liberal system of connection is established between the landlord and the tenant;—and the characters of those, by whom the labours of agriculture are carried on, whether farmers, apprentices, farm-servants, or common labourers, cannot be surpassed by those of the same description of life in any other nation. The experience of Scotland has likewise proved the superior advantages of having married servants on large farms; by means of which, the population of a country is increased, and the kingdom filled with sober, healthy and industrious subjects*.

The various points which require to be attended to, previous to the actual cultivation of an arable farm, are in general ascertained, by the practice of Scotland, with a degree of precision hitherto unexampled.

The farmers of that country have established it as a principle, that the position of a farm-house and offices ought to make a material difference in the rent of a farm;—they

* These particulars are explained in the three dissertations of Part II.

have ascertained the best construction of farm-houses and offices, uniting economy and convenience;—they have pointed out the best size and shape of fields, by means of which, much land is rendered productive, that would otherwise be wasted in useless fences, and much labour in their cultivation; saved insomuch, that where the fields are large, five ploughs will do as much work as six can in small fields, and every other part of the cultivation of a farm will be executed with less power, in nearly the same proportion;—they have likewise pointed out the inconveniences attending expensive fences, which are more ornamental than useful to a country;—they are fully aware of the importance of draining, and have practised it with success;—they have ascertained, that by the introduction of good roads, the value of a country will be greatly increased;—their instruments of husbandry are cheap, and well constructed; their ploughs excellent, worked by two horses *, and peculiarly well calculated for general use; and their carts superior to any other for agricultural purposes;—their live stock are valuable, well calculated for their soil and climate; and their horses, not only well adapted for the labours of husbandry, but maintained in such a manner, as to render them capable of performing a great deal of labour;—in some cases they have tried a partial use of oxen with success, more especially in threshing-mills;—nor do they neglect to pay a proper degree of attention to the articles that ought to be raised upon a farm, according to its soil, its climate, its elevation and exposure, and its situation in respect of markets.

* In Norfolk, they use only two horses in a plough, but four horses are commonly allowed for each plough, two for a journey of five hours in the morning, and two more for another journey of five hours in the evening.

In regard to the actual cultivation of an arable farm, many points of infinite importance have been ascertained by the experience of Scotch farmers, in a manner the most satisfactory. They have ascertained the proper length, breadth, and shape of ridges ;—in the use of putrescent, and still more of calcareous manures, they have made great improvements ;—they have proved, beyond the possibility of doubt, the advantages of deep ploughing ;—they have completely ascertained the advantages of summer-fallowing, where soils are either of a clayey nature, or are incumbent on wet subsoils ;—they have carried on with success, some essential improvements in the cultivation of various crops, in particular in regard to those important articles, turnips and potatoes ;—they have also brought to a high degree of perfection the course of crops calculated for different soils ; and have ascertained the rotations for which each description of soil is respectively best adapted ;—they cultivate in drills, beans, turnips, and potatoes, in a manner not to be surpassed for its excellence, and they have laid it down as a maxim, that crops of grain should be drilled, where the land is sown in spring, particularly where it is subjected to annual weeds * ;—they have also made some improvements in harvesting grain ; in particular, the plans of cast-iron pillars and bosses, are admirable inventions for a wet climate, by means of which, the harvesting of grain, and of pulse in particular, may be completed in half the usual time ;—they have brought the cleaning and threshing of grain to the highest degree of perfection ; almost every individual, who has any claim to the character of a farmer, having fanners in his possession, and threshing-

* It must be admitted, at the same time, that the drilling grain crops, is more generally practised in England than in Scotland, but that is not the case in regard to beans, turnips, and potatoes.

mills having become almost equally general;—they have carried, to a great extent, the practice of soiling horses, and even cattle; and have proved, by decisive experiments, the superiority of that plan;—they have restricted the practice of preserving permanent pastures within reasonable bounds, and have proved, that the convertible system of husbandry, may be generally adopted, to the great benefit of the landed proprietor, and of the public.

These are circumstances connected with the improved system of husbandry established in Scotland, the existence of which, I trust, is abundantly proved in the course of the preceding observations.

The result of this system is in the highest degree satisfactory. In all the corn districts, where the convertible husbandry is thoroughly established, greater crops are raised, and higher rents are paid *, than in any other part of the British dominions, and, what is equally remarkable, the condition or circumstances of those engaged in agriculture, evidently bear the like marks of abundance. Without enlarging upon these matters in this place, I may only add, that the produce of crops, in good seasons, and in fertile districts, is calculated to be from 32 to 45 bushels of wheat, from 48 to 55 bushels of barley, from 60 to 75 bushels of oats, and from 30 to 35 bushels of beans, Winchester measure, per statute acre. As to green crops, 30 tons of

* Mr Curwen, in his Report to the Workington Society for the year 1810, p. 86, states the rent of fertile land in East-Lothian to be L.6 per Scotch acre, and the produce, 40 bushels of wheat, 60 of barley, 90 of oats, excellent beans, weighty crops of turnips, and most luxuriant crops of clover. It is proper, however, to observe, that this is only applicable to the more fertile soils. A farm of 330 acres of arable land near Dunbar, has lately been let at L.8, 2*s.* per Scotch, or L.6, 10*s.* per English acre.

turnips, 3 tons of clover, and 8 tons of potatoes, *per statute acre*, are no uncommon crops. Any system that can produce crops of so superior a description, even on fertile soils, is well entitled to imitation, more especially when it is accompanied with great economy in the expence of cultivation.

Forty-four years have now elapsed, since one of the ablest writers on agriculture in modern times, (Lord Kames), pointed out the imperfection of Scotch husbandry; and it is singular, that, with hardly any exception, these imperfections have since been removed. Had it not come from such high authority, it is hardly possible to credit, that within the memory of so many persons now living, our agriculture could have been so miserably deficient as it seems to have been at that time. The learned Judge represents, our instruments of husbandry as sadly imperfect;—our draught horses as miserable creatures, without strength or mettle;—our oxen scarcely able to support their own weight, and ten going in a plough, led on by two horses;—the execrable husbandry of infield and outfield generally established;—the ridges high and broad, in fact, enormous masses of accumulated earth, that would not admit of cross-ploughing, or of proper cultivation;—shallow ploughing universal;—ribbing, by which half the land was left un-tilled, a general practice;—summer fallow, though common in three or four counties, yet only creeping on in others;—over the greater part of Scotland, a continual struggle for superiority between corn and weeds;—the roller almost unknown; no harrowing before sowing, and the seed thrown into rough uneven ground, where the half of it was buried;—imperfect rotations of crops;—little skill in harvesting;—no branch of husbandry less understood than manure;—potatoes in general propagated in lazy-beds;—swine but little attended to;—and very few

farms in Scotland justly proportioned to the skill and ability of the tenant*. What a contrast to the description I have just given, of the husbandry of Scotland at the present period!

Among the circumstances which have occasioned so extraordinary, and so rapid a change, in the husbandry of Scotland, that turn for reading, by which the Scotch farmers are so peculiarly distinguished, though already pointed out, ought to be more fully dwelt on. Nothing can be more absurd than to imagine, that the communication of information by printing, which has promoted the advancement of every other art, should be of no use in agriculture. It is not recommended, that a practical farmer, should take for gospel what he reads in print, and should alter his whole system accordingly; but let him reflect on what he reads, let him try, on a small scale, useful experiments, and let him extend them when they are found to answer. At any rate, he may find in books a number of useful hints, which may be entitled to further enquiry. Hence the writings of Kames, and those of Anderson, Dickson, Home, Wight, &c. in Scotland, and those of Arthur Young, Marshall, and others, in England, gave a great spur to the improvement of Scottish husbandry, by directing the attention of the farmer to the principles of that art to which their lives were devoted.

The practice adopted by the Scotch farmers, of travelling to England, and in some cases even to foreign countries, removed a cloud of prejudices, which could only be speedily, and completely eradicated, by ocular inspection.

No circumstance, however, had a more powerful influ-

* See Kames's Gentleman Farmer, Appendix, Art. 1. On the Imperfection of Scotch Husbandry.

ence in promoting a spirit of improvement in the northern part of the kingdom, than the formation of a Board of Agriculture ; and from that era, in the opinion of the best informed agriculturists in Scotland, may be dated, that wonderful change which has taken place in Scottish husbandry. In consequence of that establishment, as remarked by an intelligent farmer *, “ a general desire seized all ranks to promote internal improvement. By means of that institution, great numbers of new men were brought forward to public notice, whose names otherwise would probably never have been heard of ; and these being chiefly practical people, in other words, persons professionally concerned in farm management, agriculture, by their endeavours, was rescued from the hands of theorists, and a revolution, of no small extent, accomplished in rural affairs. Before the Board was instituted, the bond of connection amongst agriculturists was slender, and served few useful purposes, each standing on his own strength and information ; and unless in the case of those who travelled about to collect useful information, (and the number of those, at that time, was not great), they knew little more about the practices of conterminous districts, than those of China, or the most distant countries. The establishment of the Board did away at once all those evils and difficulties : a common fortress, erected for the benefit of all agriculturists, and to which each might resort for advice and protection, was immediately recognized. It made farmers, who resided in the most distant quarters of the kingdom, acquainted with one another, and caused a rapid dissemination of knowledge amongst the whole profession. It did more—the art of Agriculture was brought into fashion ; and this being the

* See Brown of Markle's Treatise on Rural Affairs, vol. I. p. 30.

case, old practices were amended, new ones introduced, and a degree of exertion manifested, which had never before been exemplified in this island. The numerous surveys of husbandry, executed under the authority of the Board, were of singular advantage also, because they brought to light the practices of every country; and whilst they pointed out the obstacles which lay in the way of improvement, stated the most effectual methods of removing them. The very collision of argument which such discussions occasioned, was of advantage, causing agriculturists to investigate the principles of the art which they professed, and inducing them to search after new channels of improvement. In a word, the Board, in a few years, collected a mass of agricultural information, hardly to be equalled, and not to be exceeded, by the accumulated stores of every other nation."

Mr John Shirreff likewise attributes the rapid improvement of Scotland, to the interesting information communicated by the Board of Agriculture, at a time, when the minds of men were qualified, from education and observation, to put a proper value on it, and whilst their capitals, arising from that powerful stimulus to improvement leases, enabled them to execute those improvements which this interesting and various information suggested.

In a communication from Mr Charles Alexander, a respectable farmer near Pebbles, it is observed, that the publications of that Board, and other recent works on farming, in particular "The Farmer's Magazine," printed for the express purpose of promoting the views of the Board, were read with avidity; that a spirit of enquiry was thus excited, and that improved agriculture was universally considered to be, *a sort of coining of money*. Hence a large share of capital, that did not originally belong to agriculture, and never was acquired by it, was thrown into the

scale; an unprecedented competition arose, for purchasing and leasing land; an increased spirit of agricultural improvement was the result, the effects of which soon became almost universally conspicuous.

The exertions of many other public-spirited institutions, in particular those of the Highland Society of Scotland, were of the greatest service; and a number of provincial societies, in their several districts, propagated the spirit with success*.

But information and skill would have been accumulated in vain, had it not been that, by the extension of paper currency, and the establishment of banks and branches in almost every county in Scotland, the farmers were furnished with credit, and supplied with the readiest means, of converting the produce of their farms into the circulating medium of the country, and were thence enabled, not only to continue their exertions, but to lay out considerable additional sums on the improvement of their several occupations.

These circumstances combined, in addition to those already pointed out, will, I trust, account, in a satisfactory manner, for the great advancement that has been made in Scottish husbandry.

* The advantages of provincial societies are ably explained, by Sir George S. Mackenzie, in the Ross-shire Report, p. 332.

SECT. II.—*Improvements of which the Husbandry of Scotland is susceptible.*

Let us now consider some particulars which may be entitled to the consideration of Scotch farmers, for the improvement of the systems they have adopted. It must not be imagined that they have nothing to learn ; and it has been well observed, that though the Husbandry of Scotland, in general, has recently been so much improved, as naturally to suggest very high notions of its peculiar excellence, yet if the farmers of that country were to entertain an idea, that the system is already nearly perfect, it would be attended with mischievous consequences. I am convinced, however, that the farmers in that part of the united kingdom, instead of a blind adherence to any system, however plausible, will always be ready to listen with due attention, and, where it is proper, will be willing to adopt any new improvement, that can be suggested in the art of husbandry.

1. The ablest farmers in England have laid it down as a rule, that all the straw of a farm should be converted into dung, by the live stock feeding on something much better than straw ; and this opinion is founded, not on theory, but on the practice of common farmers, whose scale of business is great, and whose success is decisive. They maintain, that when stock is fed upon straw alone, they are always lean, and the dung they produce of little value ; whereas, when they are fed on rich food, there is no end to the fertility of which such a system might be productive. One of the great advantages which the corn-distillers derive from the posse-

sion of farms, results from this circumstance, that the refuse of the distillery, enables them to feed a number of cattle, and to employ their straw principally as litter to be converted into dung. With the same view, the farmers of Norfolk have bought oil-cake at 16, 17, 20, and once at 22 guineas *per thousand*, for the purpose of feeding cattle, and converting straw into dung. There is reason to believe, that when the farmer can sell beef at the price of 8d. *per lb.* and has a proper quantity of litter, that he can safely give 12 guineas *per thousand* for oil-cake *. It is certainly, however, going too far, to recommend, that *all* the straw of a farm should be converted into dung. Bean and peas straw, when well harvested, is but little inferior to hay; even cut straw is often good fodder for the early part of the winter. These are cheap and useful substitutes for hay, which is principally required for work horses, in the spring months, when straw has lost its juices. Mr Curwen indeed is of opinion, that a moderate quantity of straw contributes much to the health, both of working and feeding cattle; and in particular keeps their bowels in proper order, whilst fed with turnips.

There are various other means, by which putrescent manure can be increased, as, by cutting the crop as low as possible; mowing and gathering the stubble; collecting weeds, and converting them into manure, &c.; but augmenting

* In Norfolk, they frequently buy what are called foreign manures. One individual, who occupies a light land farm of 1500 acres, had, at one time, a compost heap for turnips that cost him L.900. That exertion, however, is surpassed by Mr Walker of Mellendeau, in Roxburghshire, who, in one year, limed 304½ English acres, at the rate, on an average, of 43 bolls of shells *per acre*, (4 Winchester bushels each boll); the price *per boll*, at the kiln, was 1s. each; the expence of carriage 3s. *per boll*, the distance being twenty-four miles; and the total expence, in one year, amounting to no less a sum than L.2652, 10s. sterling.

green crops, so as to convert the straw into dung, is unquestionably the most important.

Dr Moodie of Clackmannan, with a view of increasing putrescent manure, recommends employing boys and girls with baskets, or light wheel-barrows, and a small shovel, to gather the dung that is dropped on fields in pasture. It would in this way be done at a small expence. He calculates, that each cow or ox would produce from five to ten cubic yards in a summer, and that of the richest quality, the greatest part of which would have been totally lost by evaporation, and the remaining part would have injured the pasture, at least for that year. But where the soiling system is adopted, all this trouble is rendered unnecessary, and the whole dung is not only obtained, but at much less expence.

2. The proper management of dung, is also a subject of great importance not yet perhaps fully understood. When dung is ploughed in shallow, the air, rain, sunshine, and wind, alternately act upon every portion of it that is exposed, or that becomes so by successive surface operations. Hence, it is of importance to cover the dung sufficiently, and not, by repeated tillage, to expose fresh portions of it to the action of the atmosphere. Where fresh dung is used, it is contended, that it should be deposited at the depth of eight or nine inches from the surface. It is thus safe from the immediate action of those agents, which rob it of the substance most nutritious to plants. It may be placed at such a depth, as will render it accessible by the roots of the crops; at the same time it has been ascertained, that the roots are fed by dung thus deposited, even before they reach it; a doctrine confirmed by Mr Scott's mode of cultivating carrots above detailed. Mr Parker of Munden in Hertfordshire, also, ploughed in his dung nine inches deep, and has found by experience his crops improve under that sys-

tem. These are circumstances well entitled to the consideration of intelligent farmers.

3. The use of scufflers might be extended in Scotland with great advantage. It would save ploughings, when the land is worked in autumn for the reception of crops in spring, as, in that case, it should not be ploughed again, but merely scuffed. If the ridge is narrow, the scuffer might be made to fit its breadth; and by one horse going in each furrow, the farmer can get on to wet land much sooner, than if, in ploughing, one of the horses were permitted to tread on the ridge itself. Some scufflers are light, and calculated for two horses, but others, much heavier and stronger, are used to save ploughings in summer fallows, and also for working bean stubbles, when they are in such condition as to be fit for wheat or spring corn.

4. The skim coulter, invented by the celebrated Ducket, is another instrument by which the expence of cultivation may be diminished; for by its means, a single ploughing is more effective than several, more especially where weeds or any sort of stubble are to be turned down. No plough ever yet invented will effect this object so well as a skim coultered plough; by means of which, all weeds, stubble, fragments of mown tares, and clover, as well as long dung, are so completely buried, that succeeding shallow tillage does not disturb them; and they are consequently left to dissolve, without the gaseous effluvia of fermentation escaping into the atmosphere. This is a point of the greatest consequence, and a neglect of it has in many cases destroyed the effect of ploughing down green crops as manure *.

* Mr John Shirreff remarks, that the advantages of a skim coulter, for the purposes above mentioned, are evident; but it must not be supposed, that these can be obtained, without additional power of labouring animals, or more exertion from the same animals, which, if oppressive, will be the

5. Spring sowing, without spring ploughing, is a favourite practice in some of the best cultivated districts of England. On strong land in Suffolk, after scarifying merely, they sow barley, or oats, after fallow, or beans, pease, or tares, after what is called a bastard fallow. In all these cases the tillage is given in autumn, and the crops are put in so early, that they are infinitely cleaner and earlier, than if a spring ploughing were given them, which would have considerably prolonged the sowing. For beans, this practice has been found peculiarly excellent, and has been attended with such success, that it has spread from Suffolk to Essex, where they have not hitherto tried it much with barley and oats. In so far as regards oats, more especially on a clover ley, this plan has been the uniform practice in all the more improved districts of Scotland, where the farmers are accustomed to sow their seed on the winter furrow, or at least on a furrow given in January or February, and consequently that has received the benefit of frost. It is proper to add, that from a recent communication from John Moseley, Esq. of Toft, near Brandon, it appears, that in Suffolk the system of scarifying is becoming predominant, and that from the fine tilth it gives to the lands, there is every reason to believe that it will entirely exclude the application of the plough to heavy lands *in spring*.

6. The late Mr Scott of Craiglockhart lamented much, that in some parts of Scotland, the improvement of land was often but imperfectly executed. In many instances the liming was done sparingly, and the ploughing was shallow

most expensive of the two. If two horses can draw a plough raising a furrow-slice six inches deep, if you attach the skim to bury the surface, say two and a half inches of it, the labour of the animals will be increased at least 50 per cent. when the stiffness, and consequent resistance of the lower part of the furrow-slice, are taken into account. In most cases, Mr Shirreff thinks that it would be better to use two ploughs.

and superficial ; in consequence of which, many fields, after being to a certain extent improved, rapidly reverted to as had a state as ever, and in some cases, were rather worse : whereas, had these fields got a full dose of lime, and been thoroughly ploughed and cultivated, and laid down for pasture, such a sward of grass might have been procured, as, with proper management, might have kept the land in a fertile state in all time coming. These observations, however, are only applicable to the less improved districts of the kingdom.

7. In the pastoral districts, the plan of folding sheep, as practised in various parts of England, is to be recommended. At present their manure, scattered over extensive tracts, is of little or no avail, being either dried up by the sun, devoured by flies, or washed away by rains ; whereas, if the sheep were folded at night *, considerable tracts of ground might be brought under a regular system of cultivation, by which, 1. Winter food for the stock would be secured ; 2. The sheep would be tamed instead of running about in a wild state, and consequently would be more valuable to the farmer who bought them for feeding, being more easily fattened ; and, 3. By preventing the sheep from pasturing in the cold seasons of the year, until the dew was gone, there is reason to believe that the fatal disease called the *braxy*, and other disorders, might be obviated. It is calculated that the dung of every sheep, properly folded, is worth to the farmer, from 4*s.* to 5*s.* *per annum*, which is more than the sum generally paid in Scotland as rent for the pasture. This perhaps is the greatest improvement that can be introduced into the management of our sheep-farming pastoral districts.

* Nothing is so grateful to sheep as fresh ploughed land, in the hot summer months, when they should be folded even in the day time, after they are fed.

8. I shall now take the liberty of suggesting a new rotation for strong lands, and explaining the principles on which it is founded.

I have always considered that rape might, by proper management, be rendered at least as profitable, and as useful a crop for strong lands, as turnip is for the lighter soils. Rape does not require more manure; it produces as great, and often a greater quantity of food; it is not more exhausting to the land, if it is not suffered to go to seed; and it is a stronger food than turnips, and of a more fattening quality; wheat also, after rape, is hardly ever mildewed, for it smothers and destroys the seeds of the fungi, so injurious to wheat. On all these grounds, it is much to be regretted, that the culture of so valuable an article is so little known in Scotland.

It appears from the evidence of the most intelligent farmers in Scotland, that a summer-fallow is essential for the advantageous culture of clay soils, or those on retentive sub-soils; that is to say, that such soils ought to be ploughed five or six times, thoroughly pulverized, and cleaned of weeds, between the end of the preceding harvest and the end of July, or the beginning of the following August. Be it so. But that is not inconsistent with the following plan.

As soon as the summer-fallow is completed, (the earlier the better), sow rape in drills, in the same manner *, and with the same quantity of manure as turnips. Mow it for stall-fed cattle, or sheep in well-littered folds, or let it stand till the dry season in February and March, and then you may feed it with sheep. The produce will be immense, probably from 30 to perhaps 50 ton per acre; and according to the season, you may sow it with wheat or barley, and clover. In the spring, from the dryness of that period of

* The hole of the drill must be wider, as the seed of rape is larger than that of turnips.

the year, even strong land may be sheep-fed. By this plan, all the advantages of a fallow may be obtained, gaining at the same time a crop of considerable value.

9. A variety of miscellaneous articles might here be touched upon ; as, the use of oxen, instead of horses, for threshing-mills ;—good breeds of swine, from Essex or Suffolk, and a correct system of managing them ;—on arable farms, Leicester sheep might be introduced with advantage, and composts of moss and dung for lands in tillage ;—and on grass lands, composts of earth, moss and lime might be used, in cases where they cannot be conveniently broken up.

I cannot conclude this Section, without earnestly entreating the peculiar attention of the Farmers of Scotland to these hints ; which are principally intended, with a view of exciting discussion, and of promoting enquiry and experiment. The Farmers of Scotland have already materially improved the art of agriculture ; and it will not be difficult for them, with the skill and capital they have already acquired, and the abilities and persevering industry by which they are so eminently distinguished, to render their system of husbandry, as perfect as the nature of their soil, and the circumstances of an unfavourable climate, can possibly admit of.

SECT. III.—*On the Means of disseminating the useful practices of the best Scotch Farmers, in the less improved Districts of England and Scotland, and on the public and private Advantage thence to be derived.*

Throughout the greater part of England, until about the commencement of the American war, there was but little inducement to make any great exertions for the improve-

ment of agriculture. The rents were low ; the markets good ; the climate favourable ; and, in many extensive districts, leases were almost unknown, and, strange to tell, were not even wished for by the farmer. The landlord and the tenant jogged on together : the one satisfied with an inferior rent, and the other with his share of a moderate produce *. Indeed, so long as the common-field system exists, by which alternate ridges are occupied by different tenants, and sometimes belong to different proprietors, improvements are impracticable upon all land that comes under that description ; and though Bills of Inclosure, or, more properly speaking, regulations for the local division of common property, have, in some degree, alleviated the evil, it is far from being completely removed.

In so extensive, and, taking it on the whole, so fertile a country as England, many branches of agriculture, in the course of successive ages, must have made considerable progress, and some of them, more especially the management of stock, and of grass lands, have been more successfully attended to. The Flemish husbandry, first established in Hertfordshire, under the auspices, and at the expence of Cromwell, extended itself into the neighbouring districts : the culture of turnips was introduced into Norfolk ; regular rotations of crops were pretty generally adopted ; information was spread, by the examples of intelligent landlords, and by the publication of many valuable works on agriculture. The spirit, however, was still languid and inert, and agriculture was scarcely considered by our statesmen †, as any material

* The average produce of wheat in England, is calculated at 22 bushels per statute acre. There can be no difficulty, under a proper system, in raising it to 30 bushels, and even more.

† See the Appendix.

source of national prosperity, until its utility and importance were publicly recognised, by the establishment of a national institution, for the purpose of promoting its improvement.

In Scotland, improvements commenced later; but they were carried on with more spirit. Every part of England, and even foreign countries, were ransacked, to collect information; examples of good husbandry were not only introduced, but improved upon; the farmers were encouraged to industry and exertion by long leases; their farms were properly arranged, and that system of agriculture was established, which I have endeavoured to describe, and which has already extended itself over all the most valuable districts in that part of the kingdom.

To those who will take the trouble of examining the account I have given of the Scottish system of husbandry, it will probably appear, that there are a number of particulars therein contained, which are well entitled to the consideration of English farmers; and though it is impossible to specify all those which might be adopted, (for they must vary in different districts), yet it may not be improper briefly to point out some of the most essential, whether applicable to the landlord or the tenant.

In regard to the landlord, the following particulars will require his attention:—The farm ought to be of a proper size, and not less than from 300 to 500 English acres, according as it may suit the capitals of the farmers in the district, or strangers may be introduced into it;—The rent such, as to enforce industry and exertion, and not so low as to encourage indolence;—The leases *, to a farmer in

* Mr Pringle of Ballencrief observes, that the English proprietors ought to have it pressed upon them to grant leases; without them it will

actual possession, ought to be granted for 21, and to a stranger for 25 years; for the latter is entitled to expect additional encouragement, if he comes from any distance;—The covenants contained in those leases, ought to be fair, and even liberal;—The farm-buildings should be placed in as central a situation as possible, and the house and offices made convenient and comfortable;—The formation of good roads, to be considered the most essential of all improvements, and as the surest means of adding materially to the value of an estate.

As to the tenant, it may be proper to keep the following particulars in view: The farm should be divided into fields of a proper size, and the ridges formed of a length and breadth suitable to the soil and climate, and to the nature of the course of crops to be adopted;—The lands should be ploughed as deep as the staple of the soil will admit of;—The ground kept thoroughly clean, by fallowing or drilled crops;—Turnips, potatoes, and beans, ought always to be drilled, hand-hoed, and horse-hoed; and some intelligent Scotch farmers maintain, that pease, and all crops of grain sown in spring, should be drilled also;—Two white crops of grain in succession not to be permitted;—A threshing-mill and fatners ought to be considered as indispensably necessary on every farm;—Two-horse ploughs are greatly preferable to those with wheels;—Single-horse, or even double-horse carts, ought to be used, in preference to wag-

Be in vain to look to the farmer for any substantial improvement. An addition of rent may have the effect to quicken a tenant's industry: this, however, may be pushed too far. Improvements, and the ability to bear them, ought to precede the great increase of rent; and he apprehends, that in this case, as in many others, the cause is often mistaken for the effect. Sometimes, perhaps, they change places, and become alternately one and the other.

gons, as infinitely better calculated for the purposes of a farmer * ;—To lessen the expence of farming, economy in the feeding of horses should be particularly attended to ; and where circumstances will admit of it, the breeding of horses necessary for the use of a farm, instead of purchasing them at high prices from other districts ;—The system of soiling horses and cattle, ought to be adopted, which diminishes the expence of their maintenance, and increases the quantity of dung ;—A greater extent of land ought not to be kept in permanent pasture, than is absolutely necessary for the uses of the farm ;—And the dung used on a farm, either put in the furrows, or centre of a drill, or so deep, that it will not be liable to be exhaled by the sun.

It is hardly necessary to add, that the practices above enumerated, are not peculiar to Scotland, many of them having originated in England ; but, on the whole, they are more systematically pursued, and more deeply rooted, in the more improved districts of Scotland, than in any part of the united kingdom, with which I happen to be acquainted.

I shall now proceed to give some account of the introduction of the Scotch systems of husbandry, into various parts of England, where, though it has certainly not uniformly succeeded, yet the exceptions are but few, and can easily be accounted for.

* Mr Church of Hitchill remarks, that he has often been astonished at the extravagant waste of labour, by the use of that unwieldy machine, the waggon. He has seen a large waggon, drawn by four gigantic horses, traverse a field for a few scattered sheaves, which could easily have been drawn by a one-horse cart. The celebrated George Culley observes, that he has long been a great advocate for single-horse carts, and is sanguine enough to believe, that the time is not far distant, when they will become nearly general, and waggons totally or nearly disused.

A public-spirited and intelligent country gentleman, (James Brougham, Esq. of Howis, near Penrith), informs me, that he has farmed entirely on the Scotch system for four years, his bailiff and most of his ploughmen being from Scotland; and he is satisfied, that he has done more work, and to better purpose, than he could have done, had he followed the mode of farming adopted in many parts of the same county, where a different system is pursued. His predecessor in one of his farms told him, he could never get turnips to grow; that he never had potatoes sufficient to supply his family, and quite scouted the idea of sowing grass-seeds. This was the opinion of all the neighbourhood: they now see, however, that it only required the turnip and potatoe crop to be properly cultivated, and the land to be clean, and in *good heart* when sown with grass seeds, to grow as fine crops of turnips and of clover and rye-grass as can be seen in any part of the kingdom.

Among the advantages of the Scotch system, Mr Brougham remarks, that the farm-buildings in Scotland are in general much more convenient than those in England. In a large farm, there is the difference of at least the labour of one man throughout the year, between a convenient and an inconvenient set of offices. Threshing-machines are also a very great saving, and would certainly be erected wherever leases are given. Considering the high price of horses, servants' wages, corn, hay, &c. he is convinced, that there would be a saving of above 10s. *per acre*, on the average of the arable land of England, were the Scotch system of working and feeding horses introduced, and the buildings, &c. on a more convenient plan *.

* Were long teams prohibited, the saving would probably be a great deal more.

Mr Brougham adds, that the system adopted by him has, in several instances, been imitated by others. Some of the gentlemen farmers near him, seeing that his horses did so much more work than their own, have got some of the same breed. He intends to get a good stallion, and to shew him in the county next year. The farming horses in his neighbourhood are of a small size, having been crossed with a sort of half-blood, until they are become the most useless cross-bred animals to be seen any where.

Admiral Bentinck has successfully introduced some branches of the Scotch system into that district of Norfolk called Marshland. In October, 1809, he invited some farmers to see a Scotch plough worked *; and seven of those present, immediately ordered one each. Lord William Bentinck has taken a farm in that neighbourhood into his own hand, and has established there a young Englishman as his bailiff, who is well acquainted with the Scotch system, and convinced of its advantages. By his means liming, (a practice totally new in Marshland), will be introduced, which, with drilled green crops, and stall-feeding cattle, will be the first experiments.

The late Mr Wolstenholme, who resided near Weymouth, to whom I had recommended a Scotch bailiff, informed me, that the new system answered incomparably well in Dorset. He ploughed strong land with two horses a-breast, with reins, and no driver, and the plough worked much easier

* The prejudices in some parts of England, against the introduction of swing-ploughs, with two horses a-breast, are astonishing. A gentleman who had tried one, could not prevail on a neighbouring farmer to imitate his example. He could not afford, he said, to try such experiments. Many farmers suppose, that wheels are necessary to keep the plough out of the ground, as if that could not be effected by a skilful ploughman, with an instrument properly constructed.

with two horses, than the country plough did with four; the expence of a driver and two horses is thus saved; the horses turn at the land's end, in half the compass; the mould-board turns the furrow clearer and more completely over, consequently buries the surface better, leaving no green edge to grow; it saves more than half the expence of harness, as, exclusive of two sets, instead of four, the harness is made much lighter, with hempen traces and hempen halters.

Mr Wolstenholme considered the Scotch system as certainly cheaper, and that it raised better crops, the ground being better tilled, and in better season. He was of opinion, that the Scotch husbandry ought to be considered as enabling the farmer to meet *new rents*; without it, he was certain that many of these rents could not be paid, where the poor-rates, tithe, and revenue-tax, joined to the rise on land, fall so heavy; and even now, if corn were to fall to its former prices, he much doubted if they could stand it. His neighbours had all been frequently over to examine his implements, and to see how they were used, and he had no doubt, would (at least the most liberal) follow the example. He farther observed, that one cause of the miserable farming now seen is, the poverty of the tenants, and their taking farms four times too great for their capital. Now the Scotch system lessens the expences at least half, while it raises the produce; the result is obvious. It also has a strong tendency to increase knowledge on this most useful subject, to excite emulation, and consequently to encourage and promote new discoveries.

Major Dallas of Tremanny, near Welshpool, has established this system in Wales, where he is carrying it on most successfully. He has been the means of introducing, into that part of the kingdom, the two-horse ploughs, Scotch carts, and threshing-mills, and, on an average, about fifty

of each are now annually made, by a Welch carpenter and smith, from the models given them. The Cheviot breed of sheep has also been introduced, and, above all, the Scotch mode of drilling turnips; by following which system, a neighbouring farmer raised, to his great astonishment, 40 tons *per* English acre.

In some places, Scotch farmers may not have succeeded, owing to the want either of skill or capital; but wherever they have been properly encouraged, and have not been deficient in these two most essential articles, they have in general shown the most convincing proofs of the utility of their system.

If it is admitted, that in some districts of England, the Scotch system of husbandry might be introduced with advantage, the next question is, What is the best mode of effecting that object? With that view, I have drawn up the following

*Plan for transferring the Husbandry of Scotland into
England.*

If any proprietor of land in England is convinced, that it is for his own, and the public interest, to alter the system of husbandry adopted on his estate, the following plan is submitted to his consideration.

To the young and active landlord, it might be expedient to examine upon the spot, the real state of Scotch husbandry, in the more improved districts, to see the manner in which it is conducted, and the effects that have resulted from it, and to ascertain, how far such a plan is applicable to the estates he possesses.

If an excursion to Scotland is either inconvenient or impracticable, it would be necessary to consult with those who are thoroughly acquainted with the system proposed to be

adopted, cautiously avoiding such as are more likely to attend to their own interest, than the advantage of their employers.

If the proprietor has a farm in his own occupation, it might be proper to procure a superintendent or bailiff from Scotland, whose example might tend to remove the prejudices of the farmers in the neighbourhood, against the new system which it was proposed to establish.

If any farm, from 300 to 500 acres of arable land, were accessible, it might be proper to let it to some industrious farmer from Scotland, Northumberland, or some other English county where convertible husbandry is practised, with a view of opening the eyes of the other farmers to the advantages of the new system.

The proprietor must necessarily make up his mind, to the granting of leases for twenty-one years, to the natives of the county, and of twenty-five years to any stranger brought into it, otherwise he need not expect that an improved system will be introduced.

The leases should be granted on liberal terms, with regard to covenants, but with a proper increase of rent, partly perhaps depending on the price of grain, to prevent any material defalcation in the relative income of the estate.

The outlays of the proprietor must depend upon his ability to expend money on the improvement of his estate. What is executed by a tenant, is in general done with economy and judgment; but it is not right to cripple the exertions of a new tenant, by compelling him to lay out, on permanent improvements, that capital, that ought to be devoted to the purchase of stock, &c. and to the cropping and manuring the soil.

If these measures were generally adopted, there is every reason to believe, that the income derived from at least ten millions of acres in England, might be doubled, and the produce considerably increased.

Some recommend the plan of sending the sons of farmers, for one or more years, to be taught the art of husbandry, in the districts where it is most skilfully practised. This is a slow, but, at the same time, a sure mode of obtaining the object in view, provided the young men are obliged to put their hand to labour of every kind, and are not suffered to ramble idly about the country.

But, on the whole, the introduction of new farmers, where they can be procured, is the best plan to be adopted. There must be an example of a new system exhibited, and that on a large scale, before any important alteration can be effected. The example of a landlord will not do alone, for a farmer will always attribute his success to profusion of expence, rather than to superiority of skill or management. But when a brother farmer succeeds, the case is otherwise; and if he proves the possibility of raising as good, and even better crops, with less expence, his example will, in process of time, be imitated by his neighbours, and an extensive district will be gradually improved. No proprietor will ever think of dismissing his old tenants, if they are disposed to adopt practices, the superiority of which has been established in their own immediate neighbourhood, and who will give a fair rent for the land they occupy. When new tenants are introduced, great care should be taken, to select men who are provided with capital sufficient to go through with such undertakings. By neglecting this precaution, some well-meant attempts have turned out unsuccessfully, which would not probably have been the case under different circumstances.

The principal difficulty in establishing the Scotch system of husbandry in England relates to servants. The farmer, as Mr Brougham has well observed, must bring ploughmen with him; they will soon find their consequence, and presume upon it, which may lead to a great deal of mis-

chief, unless very skilfully guarded against by the master. Binding servants to a certain term of service, and to good behaviour, &c. is worth nothing; if a master and his servants come to an actual quarrel, the sooner they are sent off the better for both parties; and from what Mr Brougham has seen, he can easily conceive, that a cross-tempered master, or one who does not understand the way of managing servants, may be left without any, at a critical time, in a strange country, where all the neighbourhood, instead of helping him in his need, would enjoy the prospect of getting rid of *the new settlers in the parish*.

Owing to these circumstances, Mr Wood of Tracy Farm recommends employing English servants: they are by no means averse to hold the Scotch plough, and indeed are rather fond of it, and soon acquire all the knowledge which it is necessary for them to obtain. One or two intelligent Scotch servants, will soon train the natives, who, on the whole, are the surest resource, and by means of whom a knowledge of improved management will soon be generally spread in the neighbourhood.

In regard to the advantages which may be derived from such a change of system, there is every reason to believe, that if the simple and economical mode of agricultural management of Berwickshire, the Lothians, &c. were adopted in the less cultivated districts of England and Scotland, it would not only enable the proprietors of land, in several most extensive districts, to pay without difficulty the taxes to which they are now subjected, but a new source of income would thence arise, whence the public treasury might, through various sources, derive a most important benefit.

By means of this improved system of agriculture, extensively established, there would be such an addition to the produce of the country, as to render the importation of

foreign articles, for the subsistence of the people, perfectly unnecessary*. The mischiefs which have resulted from that importation, have been incalculable; *and the prosperity of this country can never be insured, until it can feed itself†.*

* For above seventy years, at the commencement of the last century, we fed ourselves, though the price of grain was so low, as greatly to promote population; a sufficient practical refutation of several visionary doctrines, which have been circulated on that subject.

† These opinions are strongly corroborated by the sentiments of several intelligent correspondents in England. Admiral Bentinck states, that the *private advantages*, from the introduction of the Scotch system, would be, increase of income, and larger produce. The *public advantages*, an increasing revenue, and an augmenting capital, employed in productive industry. Mr Brougham observes, that the public, as well as the private advantages to be obtained, were the Scotch system generally adopted, must be very great: more corn would be brought to market, and more rent would be paid to the landlord. A spirit of emulation would, in the course of a short time, be created between the old and new inhabitants, "and we might see "the East-Lothian and Berwickshire husbandry, which has been so long "cast in our teeth, left behind, by the improvers of Devon and Herefordshire." Mr Brougham adds, it is extremely likely, that a great influx of Scotch, added to the increased demand for agricultural labour, which always accompanies new plans and improvements, might have the effect of materially altering the poor's rates, principally by introducing a better and more adequate rate of wages than at present exists. Mr Wolstenholme was of opinion, that the national advantages resulting from such an improved system as that of Scotland, were great and manifold, as well as obvious, more especially as it would enable us to grow sufficiently for our own consumption, instead of being dependent on others. By the Scotch system, with a proper rotation of crops, that is, never allowing two white corn crops to succeed each other, as much, or more corn, might be produced, than at present, and the intermediate green crop would support and feed a far greater stock, so that the meat market would be better supplied; and the infinitely greater quantity of manure, raised by this system, would ultimately bring the land into the highest possible condition. This being once effected, all the now poor and waste lands would be ultimately brought into cultivation, to the great increase of the wealth and population of the country.

It is impossible that such a change can be effected in a moment, though it may be brought about, much more speedily than persons can be aware of, who are not accustomed to carry on improvements on an extensive scale. Indeed, any delay ought now to be avoided. The period has at last arrived, when we must rely more and more, on our internal resources, than hitherto has been the case; and dreadful as the contest is, if we avail ourselves of those resources, we shall suffer but little by the war, if it is ably conducted, though we should be unfortunately compelled to continue it for some years longer.

I HAVE now finished a most laborious undertaking, (in so far as regards the practical branches of the Husbandry, of Scotland), which the solicitations of a respectable friend, and a sense of public duty, induced me to attempt. However anxious to promote the cause of agriculture, I could never have hazarded such a publication as the present, without, not only a general knowledge of husbandry, and a minute examination of several thousand acres of the best cultivated land in Scotland, but also with the advantage to be obtained, from frequent discussions on the subject, with many of the most intelligent farmers in Scotland. I had also the satisfaction, of receiving from them, the most distinct and valuable statements, of the systems they had respectively adopted, of the principles on which these systems were founded, and of the benefits which had thence been derived, by themselves and the public.



P A R T II.

DISSERTATIONS

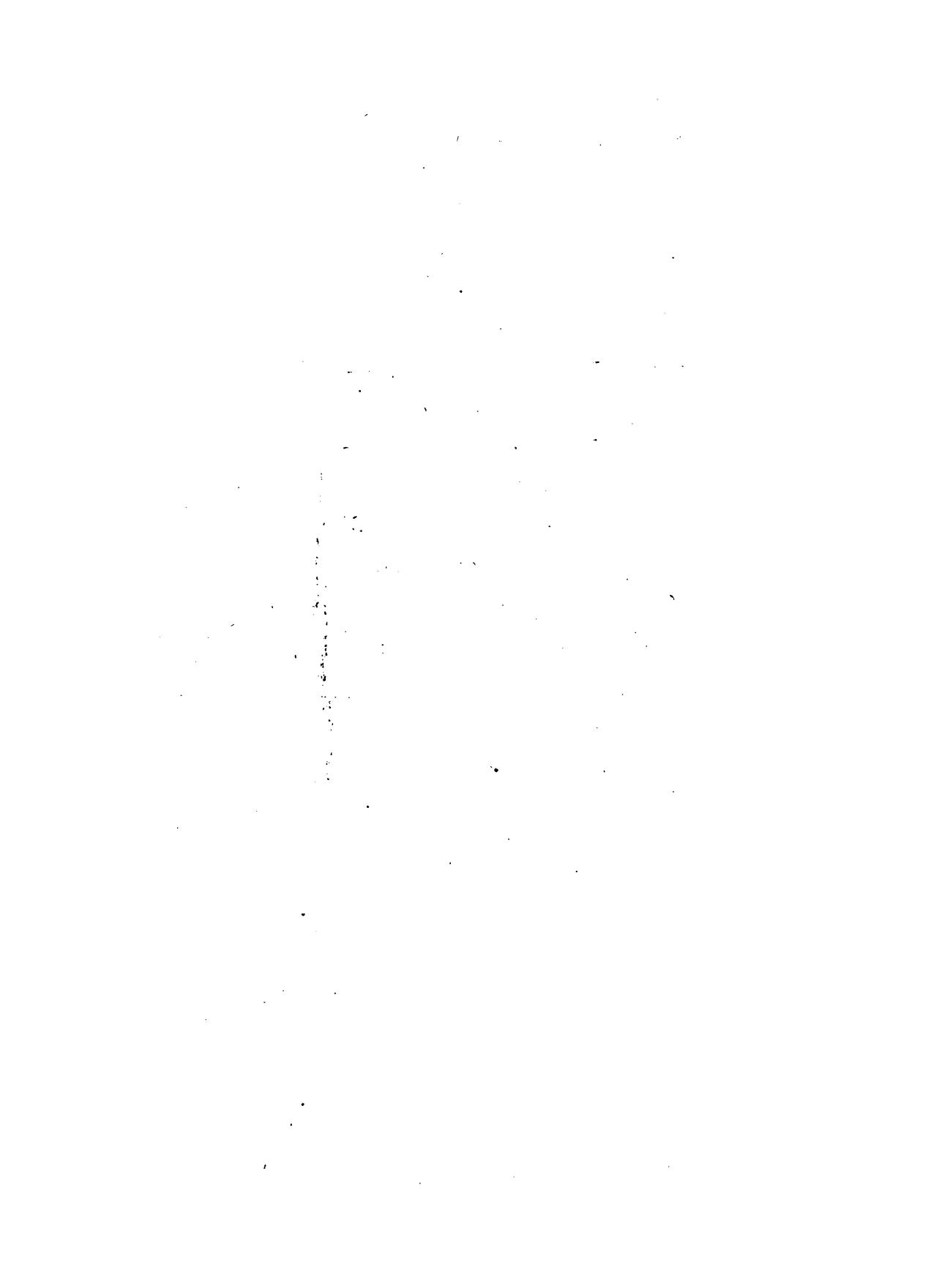
ON

QUESTIONS CONNECTED WITH THE AGRICULTURAL
IMPROVEMENT OF A COUNTRY IN GENERAL,

BUT MORE ESPECIALLY AS APPLICABLE

TO THE

STATE OF SCOTLAND.



PART II.

INTRODUCTORY OBSERVATIONS

TO

THE FOLLOWING DISSERTATIONS.

In the former Part of this Work, I have endeavoured to explain, the most important particulars connected with the practical details of the Scottish System of Husbandry. Several points, however, connected with that system, and materially tending to the improvement of that part of the kingdom, remain to be discussed; but as they are rather of an abstruse nature, as they require a good deal of research, and much reflection thoroughly to comprehend, it was thought more advisable, instead of incorporating them with the practical details, to explain them in distinct Dissertations. Their importance cannot be questioned. Indeed, all the knowledge that can be acquired of agriculture, is of little avail, unless farms of a proper size;—unless a liberal system of connection is established between the

landlord and the tenant ;—and unless, not only the farmers are well skilled in their profession, but those who are employed by them, in the labours of cultivation, are placed on the most advantageous footing that their situation in life will admit of. These are points, respecting which the Scottish System of Husbandry claims a pre-eminence over every other ; and the details of which, cannot be considered without a mixture of astonishment and delight.

We shall now proceed, therefore, to discuss these important points, commencing with that difficult subject to explain, the size of farms ; in the course of which, the various modes of occupying allotments of land, for farming, and other purposes of a similar nature, shall be pointed out.

DISSERTATION I.

ON

THE SIZE OF FARMS, AND ON THE VARIOUS MODES OF OCCUPY-
ING ALLOTMENTS OF LAND, FOR FARMING, AND OTHER PUR-
POSES OF A SIMILAR NATURE.

HAVING visited the districts in Scotland, where the knowledge and practice of agriculture is best understood, it appeared to me, that their improved state, greatly depended on the size of the farms ; and that if the farms had continued in their former extent, when, (as appears from Mr Wedderburn of St Germain's Essay, published in 1766), 126 Scotch, or 144 English acres, were reckoned sufficient for an arable farm, such great improvements as have taken place could not have existed.

The size of farms is a point, on which volumes have been written, and respecting which a considerable diversity of opinion prevails. It is impossible, however, to lay down any precise or universal standard regarding the size of farms, as so much depends upon the nature and situation of the soil, the character, skill, and capital of the farmer, and a variety of other particulars ; at the same time, it is of importance to discuss the relative advantages of the different sizes, that the subject may be the better un-

derstood. It is contended, indeed, that farms ought to be of various dimensions, and that possessions of a small, or at least of a moderate size, are desirable, for the following purposes ; 1. That persons engaged in other employments, besides that of farming, may be accommodated with small portions of land, so as to raise many articles which they cannot otherwise readily procure, on account of their distance from a market ; 2. That industrious individuals, possessed of small capitals, may have an opportunity to follow the profession of a farmer, to which they would do credit, but from which, unless some small farms were to be had, they would necessarily be excluded ; 3. That young men may be enabled to commence farming on a moderate scale ; for though possessed of sufficient capital, and regularly bred to the profession, they are so apt to fall into errors, that they ought not at first to undertake the management of too extensive concerns ; 4. That in poor, and comparatively barren countries, where there is a great irregularity of surface, and but a small extent of cultivated land lying contiguous, the farmer may have his proportion of arable land within a reasonable distance from his farm-house ; and, 5. That in such districts, where the inhabitants possess very little capital, they may not be tempted to take larger farms than they can manage to advantage ; for it is principally in the more fertile and wealthier districts, that the skill, spirit, and opulence of the farmers, enable them to do justice to farms of larger dimensions. How far such doctrines merit attention, will appear in the course of the following investigation.

In discussing a subject of such vital importance to the agricultural interests, and indeed to the general prosperity of a country, it is proposed, for the full elucidation of the various questions therewith connected, to divide farms into the following classes : 1. Small farms, or possessions under

50 acres of arable land; 2. Dairy farms. 3. Farms adjoining to towns; 4. Clay-land arable farms; 5. Turnip-land arable farms; 6. Commercial farms; 7. Pasture farms; 8. Farms for the accommodation or amusement of the proprietor; and, 9. Farms for experiment, and connected with objects of public utility. After examining the facts connected with each of these distinct species of farms, it is then proposed, briefly, to explain the result of the whole enquiry.

1. *Small Farms, or inferior Occupations* *.

Occupations under fifty acres may be treated of under the same general head. This is a subject, which it is necessary fully to enter into, as it is of the utmost importance to examine, the various modes of holding, and of managing, portions of land, whether small or great, that the advantages and disadvantages of each may be duly estimated.

We shall commence this branch of the enquiry with considering, whether labourers employed by large farmers, ought to have lots of land attached to their cottages; and whether these lots should be held independent of the farmer.

It will appear, in the Third Dissertation, that in all the more improved districts of Scotland, a large proportion of the farm-servants are married; for whose accommodation the farmer undertakes to keep a cow, (the property of the servant), during the whole year, without making any charge for its maintenance. No land is specially allotted for that

* On this subject, see the Report of the County of Peebles, p. 304, note.

purpose, as the servant's cow usually accompanies those of the master. This system has been so long established, and is productive of such benefit to the servant, more especially if he has a large family, and (as will be afterwards explained) is so advantageous to the public, that it were to be wished it could be extended to other districts, rather than abolished in those in which it is already established.

In regard to the idea of giving any number of acres to day-labourers, to be held independent of the farmer, and immediately of the proprietor, such a system is objected to on the following grounds; That day-labourers have no leisure for attending to the cultivation of any extent of land: That a small garden for potatoes, cabbages, and other vegetables, is perfectly sufficient for their accommodation; and that any greater quantity would break in upon the time they ought to devote to the assistance of the farmer in carrying on his operations: That, *in an improved district*, there is always work sufficient, at all seasons of the year, for those who are industrious: That if the labourer were thus rendered in some measure independent of the farmer, to whom he must otherwise look up for his subsistence, and were led to consider his being hired to labour as a secondary object, he would soon become idle and useless to the neighbourhood, and would either live in constant poverty from indolence, or both he and his family would refuse to work, unless paid much beyond the fair average rate of wages*:

* This subject is very ably discussed in Kerr's valuable Report of Berwickshire, p. 104, 105, &c. It has also been observed, that if labourers, by receiving an allotment immediately from the proprietor, were to be placed in such a situation, that their hiring themselves to the farmer would be optional, the very object of the institution, namely, that there should be *on the farm, an adequate number of servants always at the command, and under the control of the occupier*, would be defeated; and whilst the labourer might

That these labourers are sometimes apt to commit depredations on the property of their neighbours: That whether they have leases, or possess their land from year to year, they are likely to prove troublesome to the neighbouring farmers; but if they have leases, the nuisance can hardly fail to become almost intolerable: And, lastly, that their situation, in point of real comfort, can never be compared to that in which the hinds or ploughmen of Berwickshire, of Roxburghshire, of the Lothians, and of other improved districts in Scotland, are placed, who have abundance of the necessaries of life for themselves and their families, without any trouble or anxiety, and nothing to abstract their attention from their regular duty to their masters.

These observations are sanctioned by the authority of many of the ablest farmers in Scotland, with whom I have had an opportunity of discussing this interesting subject; and I have every reason to believe, that the same ideas are entertained by the most intelligent farmers in the more improved *arable* districts of England. Both are of opinion, that day-labourers ought to hold their occupations immediately of the farmer, and that the land they possess, ought to be restricted to portions capable of being cultivated by the spade.

By some it is contended, that no land should be occu-

(if unwilling to work for the farmer), derive a scanty subsistence from his own small occupation, it would neither enable him to educate his family, (which industrious labourers, under the present system, are able to effect), nor ever to emerge from his original sphere of life, in which he may live as comfortably and happy, as the most opulent individual in the kingdom. Thus, it appears, that on the whole, it is neither conducive to the interest of the farmers, nor the advantage of the labourers themselves, that the latter should possess any land immediately from the proprietor.

pied by any description of persons, excepting those whose sole business is farming. There are, however, various exceptions to that general rule, as in the case of, 1. Labourers by the piece, carriers, millers, and mechanics; 2. Gardeners and nurserymen; 3. Villagers; and, 4. Farmers with moderate capital, or who reside in remote parts of the kingdom, where extensive tracts of fertile land are rarely contiguous.

1. A gentleman distinguished for information and ability, regarding all questions connected with husbandry, the late Robert Barclay, Esq. of Ury, in a paper addressed to the Board of Agriculture *, has stated it as his opinion, that though labourers by the day ought not to have land beyond what is requisite for a cottage-garden, yet, that labourers *by the piece*, who are hired occasionally by different farmers, should not be subjected to the same restriction. There are also a superior sort of labourers, who contract for making and repairing roads, and other undertakings of a similar nature, or who act as carriers †, to whom the possession of a small portion of land is a great convenience. This description of persons has materially contributed to put an end to a very burdensome species of bondage, by which the tenants of many estates in Scotland, were bound to convey a certain quantity of fuel to the mansion-house of their landlord; a practice which, some years ago, could hardly be dispensed with, as fuel was not procurable by any other means; but wherever villages, with carriers as above described, are to be met with, it is no longer necessary. Mil-

* Communications, vol. i, p. 91.

† Industrious persons, possessed of small capitals, who wish to become farmers, ought to set out as carriers, &c. to which their funds may be adequate; and by activity and industry, they may in time realize a capital, which may enable them to stock farms of a proper size.

lers have likewise occasion for small farms: and to inn-keepers they are likewise considered to be advantageous, more especially when they reside in distinct houses, or small villages. Such lots of land, also, are of much use to mechanics in the country, as cart and plough makers, &c. who may not always have a demand for the articles they manufacture, and who may consider such a possession as subsidiary to their other occupations*. Lord Kames likewise contends †, that weavers residing in the country, should have lots of four acres each, weaving being a sedentary occupation, and requiring at times field-labour for the sake of health. This is peculiarly necessary where there is no market at hand for the purchase of provisions.

2. The advantages of having land appropriated for kitchen gardens, in the vicinity of towns, are too obvious to be dwelt on. The produce is great, and the vegetables thereby raised, are of infinite benefit, by coming early to market. The rent given for this description of land, near Edinburgh, is high. A lease for four years, of eight English acres of land, was lately sold for L.200, subject to a rent of L.8 per acre, which, at compound interest, makes the rent to be paid at the rate of L.15, 12s. per acre per annum; and a field of seven acres, near the Grange, at no great distance from that metropolis, is partly sublet for the same purpose, at the rate of 2s. per fall, or L.16 per English acre. Nur-

* On large estates, and in situations distant from villages, it is a great accommodation to the adjacent district, to have mechanics in the various necessary branches established in some central place. The Duke of Montrose, in this view, has broken down a farm, on a remote part of his estate, into cottaries of two acres arable, with two cows grass each, for mechanics, viz. a smith, a carpenter, a weaver, a shoemaker, a carrier, &c. The inn-keeper, for the accommodation of the public, possesses nearly as much as all the rest put together.

† Gentleman Farmer, p. 302.

series also fetch a rent little inferior to garden ground. To a well-employed nurseryman, the profit of his ground is astonishing, in one year exceeding considerably the fee-simple of the same quantity of land in situations remote from a town. Nurseries *for sale*, however, ought to be encouraged, for the sake of persons who cannot afford to farm, nor to keep up nurseries of their own. Besides, intelligent persons, who make it a business to raise trees, are more apt to have a greater variety, and to try useful experiments, than private individuals, who have other pursuits to distract their attention. Nurserymen also, will often undertake to plant extensive tracts, and to keep up a sufficient number of trees in them, at a moderate expence, which is a great inducement to the formation of plantations.

3. It is likewise maintained, that it is extremely advantageous to give allotments of land, to the inhabitants of villages and small towns. As this is a subject that has occasioned much discussion, it may be proper to state the arguments on both sides, before any practical result is attempted to be drawn from the inquiry.

This system is peculiarly prevalent on the western districts of Scotland, where coal abounds, and manufactures have been introduced. A number of villages have been erected in those districts, (generally two or three, and sometimes more, in a parish), with a population varying from 20 to even 2 or 300 families each. Around each village, a range of land, proportioned to its size, is occupied by the inhabitants. Such of them as keep horses, and such farmers also as have retired from business, generally take more or less land, and their example is followed both by the tradesmen and labourers. When the village comes to contain from 400 to 500 inhabitants, the anxiety to obtain such possessions increases, and the land fetches, from the greater demand, a higher rent. In most of the parishes in

the counties of Lanark, Renfrew, and Ayr, a number of acres, in extent greater or less, according to the population of the town or village, is rented at from L.4 to L.6 per English acre, and in some instances still higher. The size of these village possessions, as held by each individual, varies from 2 to 25 English acres, but the greater part are from 4 to 12 or 14 acres.

As milk, potatoes, and oats, form the principal means of subsistence among people of that rank in Scotland, the ground around these villages, is generally devoted to the raising these articles of food. A person who possesses four acres, will have at least half an acre in potatoes, an acre, or perhaps an acre and a half, in corn crops, chiefly oats, with a small portion in bear or barley, or even wheat, and the remainder in hay and pasture; but in some places a still greater proportion is kept in grass.

Such a mode of occupying land, it is contended, is beneficial in various respects. There is no plan, it is said, by which a landlord can expect to obtain so high a rent: Hence many intelligent proprietors have erected villages for that special purpose. John, Earl of Loudoun, for instance, founded the village of Dervel, about the year 1760, on liberal terms, with the view of increasing the value of land in that neighbourhood; and that expectation has not been disappointed, for there are about 250 acres round that village, now yielding from L.2, 6s. to L.4 per acre, while the neighbouring farms, the soil of which is equally good, are rented only at from 15s. to 19s. per acre.

If the health, the comfort, and the morals of the inhabitants, be taken into consideration, it is contended, that land cannot be better occupied than in this manner. Such villages are certainly more healthy than large towns. Labourers and mechanics must feel themselves and their chil-

ren, much happier in the former than in the latter ; and their morals, and those of their families, are not in such danger of being contaminated, as if they resided amidst a greater population. They are also much better supplied with wholesome food, as milk and vegetables, when they cultivate a piece of ground for themselves, than when they are at the mercy of others for these necessaries of life ; and not only is their health improved, but they become more industrious, by performing in the evenings, and other intervals of their labour, the little offices about their cows, their horses, and their small possessions ; whereas those who are deprived of that profitable and rational mode of spending their leisure hours, are in danger of devoting them to improper objects. There is no mode also, by which a greater produce can be raised from land, than by erecting a village*, and letting the adjoining ground in small lots to the inhabitants. The high rent demanded compels them to be industrious, in order to turn the land to the best account, and in particular to pay great attention to the collecting of manure, in so much that every corner of their portion of land is improved to the highest degree.

The milk of their cows, being either used in their families, or sold as it comes from the cow to their neighbours who keep none, it goes much farther, as an article of food, than when manufactured into cheese. It is calculated, that from 50 to 60 Scotch pints of milk, (or from 100 to 120 English quarts), may be converted into a cheese of from 16 to 20lb. English. But if that cheese could be again restored to milk, in such quantities as might be from time

* The erecting a village, on a tract of waste land, is certainly an excellent system.

to time required by the family of a labourer or tradesman, it would be much wholesomer, and would nearly go twice as far towards maintaining the family, than the cheese made from it, and the pork produced by the whey *. It is maintained, therefore, that the interest of the proprietor, the labouring class of the community, and of the public at large, cannot be better promoted, than by encouraging the villages on this principle, particularly in those districts where coal abounds, and where, of course, manufactures have been, or may be introduced †.

On the other hand, it is contended, that village possessions, of from two to twenty-five acres, for manufacturing labourers, are highly exceptionable in every point of view, whether we consider their own interest, or that of the general population. Such labourers may have, without detriment to themselves or others, as much land as they can manage *with a spade*, at intervals from their common labour, but no more. To give them a greater extent, except grass for a cow, would be to distract their attention from their proper business. Wherever land is not so rich or productive, as to pay for garden cultivation, it must be wrought by the plough, and these villagers would have to keep a joint stock of horses, of ploughmen, &c. Of the disadvantages of such a system, there has been abundant evidence in Scotland, in the case of farm labourers; and the consequences would be felt, in a still higher degree, in that of manufacturers. It is indeed quite

* Dr Franklin, when living on bread and milk, was the stoutest person in the printing office where he worked.

† These facts, regarding the villages in the west of Scotland, are communicated to me by Mr Aiton of Strathaven, the intelligent reporter of Ayrshire.

inconsistent with the benefits of a division of labour, to countenance such a plan. As to profit to the landlord, it is said, that the rent of land should always be paid from its produce, and not from the wages of operative manufacturers. Milk and vegetables will always be obtained by those who can pay for them, and these articles are always supplied when there is an effectual demand for their consumption. The produce of these small possessions, compared to that of land occupied by real farmers, will bear no comparison, and is generally miserable. It is contended indeed, if this system were extended to every district of the kingdom, where it might be introduced, that a fat ox, or sheep, would soon be as rare as they were fifty years ago, in several parts of Scotland; that all our large towns would be starved, or must be fed by importation; and that, as is the case in some parts of Ireland, potatoes would be almost the only food, consumed by the great body of the people, for nine months in the year.

On the whole, it would appear, that the plan of agricultural and manufacturing villages, having both objects in view, ought not to be carried too far; in other words, that the occupations held by the inhabitants of such villages should not exceed from one to five English acres. A Scotch acre of ground will supply the family of a tradesman with vegetables and some grain. Where a cow is kept, three Scotch acres (nearly four English), are thought sufficient, if the cattle are of a moderate size. At Peterhead, in Aberdeenshire, the lots usually consist of about four Scotch or five English acres, and they are now divided into four equal parts. The rotation is, 1. Fallow, turnips, or potatoes; 2. Bear or oats, with grass seeds; 3. Hay or pasture; and, 4. Oats. The rent has been lately increased from L.4, 10s. or L.5, to even L.6, 10s. per

Scotch acre, according to the situation and nature of the soil. The profit, after paying all expences, it is calculated will amount to about L.3 per Scotch acre.

In regard to the cow system, applicable to the situation of villagers, it is a common practice in Berwickshire, for the inhabitants, instead of taking separate allotments, to form clubs or copartnuries, and to rent any adjoining grass fields for pasturing their cows and horses. Fields of that description are annually set up to auction, and from the high rents given, may always be hired, where the villagers wish to have that accommodation. But as the profit of keeping cows, according to this system, depends upon the sale of milk, and is necessarily limited by the consumption of that article, it has frequently happened, from the supply exceeding the demand, that village cows have not paid their expences *. Near the village of Leslie, in Fife, some grass fields are annually let by auction, and the inhabitants pay a certain sum for a cow's grass. The consequence is, that great attention is paid to the breed, in particular to their being excellent milchers, as the same sum is paid for the pasture of a cow that produces a small, as for one that yields a great quantity of milk †.

In the case of newly-erected fishing villages, some ground ought to be allotted for those who settle there, to carry on the precarious profession of fishermen. A market cannot always be obtained for the quantity of fish that may be caught, and they may often be prevented from going to sea in stormy weather; the fishermen therefore must have much time that can be devoted to other pur-

* Kerr's Berwickshire, p. 105.

† Statistical Account of Scotland, vol. vi. p. 41.

poses. By the additional inducement of lots of land, a hardy peasantry may be tempted to settle in situations calculated for carrying on the fisheries. The landlord may thus increase the value of his estate, and may obtain the aid of the wives and families of the fishermen in carrying on his improvements, and the operations of agriculture.

In the more remote parts of the country, where there is not a great demand for labour, I have found by experience, that the plan of what may be called "*cottage farms*," may be advantageously adopted. Each cottage farmer should have from two to four English acres of arable land, enough to feed a small cow, and to furnish potatoes and some grain for the support of the cottager and his family; whilst the straw, &c. maintains the cow during the winter season. Where day labour is but little known, it must be introduced on the system of employing these cottagers, for 100, 200, or 300 days in the year, *as the cottager chooses*, he receiving a certain sum of money, and a certain quantity of grain, in proportion to the number of days agreed upon. Thus the cottager is led to imagine, that he receives rent from the landlord, instead of paying any. Such a plan is peculiarly suited to the temper and spirit of Highlanders, or of any set of men in the same stage of society, who abhor the idea of constant labour, but have no objection to work for a certain number of days, provided they have the remainder of their time free and uncontrolled. The cottager has thus a place of residence for his family, where he may live himself during the winter, if, from want of demand at home, he is obliged to look out for labour, during the summer and autumn, in more southern districts. Such a plan may likewise answer, even in the more improved parts of the kingdom, where the population is greater than the farmers

have occasion to employ, and where there are no manufactures to furnish this extra population with the means of subsistence.

4. In many parts of Scotland, arable farms must be of a small extent, sometimes because no great quantity of fertile land can be had contiguous, (for in situations where the arable land is intersected, and disjoined into small partitions by barren tracks, farms must be small, to prevent the waste of labour which must take place, if such ground were let in a large farm); and sometimes because farmers cannot be met with, possessed of sufficient capital to do justice to large occupations. The best size of a farm for persons with inferior capitals, is generally from 40 to 50 acres of arable land, affording employment for a pair of horses. It is admitted, that such farmers are rarely so skilful or so intelligent as their wealthier brethren, who have better means of acquiring knowledge in their profession. The former, however, are more economical, which in some degree compensates for that disadvantage. These farmers, it is said, hold their plough, feed their cattle, repair and even make some of their farming implements, are contented with a humble cottage, receive the assistance of their wives and families, both in cultivating the farm, and harvesting its produce *, and, living at less ex-

* On this subject Mr Brown of Markle very justly remarks, that the share which a farmer's family takes in the cultivation of a farm, will never save a halfpenny of the outgoings; on the contrary, his expences will be greatly increased by having any part of his labour executed by the members of his own family. They cannot be supported at less expence than hired servants, and rarely will work so much, especially if the labour of the whole season is taken into consideration. Perhaps, upon particular occasions, a temporary

pence, can afford, it is contended, to pay even a higher rent than the more opulent farmer, whose accommodations and mode of living are so different. On the other hand, it is asserted, that such farmers and their families are mere drudges ; that they live more uncomfortably than the servants on a great farm ; that they are tenacious of old customs ; that they are prejudiced against any alteration, even when obviously beneficial ; that in proportion to the extent of land they occupy, they must keep a larger stock ; that their cattle and implements of husbandry, being of an inferior description, they can never work their land to equal advantage ; and that if they can carry on the cultivation of land already in an arable state, yet in the case of waste lands, they rarely, if ever, possess spirit, skill, or capital, to carry on any considerable improvement. It is in dairy farms alone, as some maintain, that the small farmer has an evident advantage over the great one.

Some of the particulars above enumerated, regarding small farms, may not be considered as strictly coming within the principal scope of this publication. At the same time, they are of such infinite consequence to so many numerous and valuable classes of the community, that he must be a fastidious critic indeed, who objects to the discussion, or regrets that they have been brought under his review.

exertion may be made, greater than what is commonly displayed by hired labourers, but it generally happens that a proportionable relaxation afterwards takes place.

2. Dairy Farms.

In Ayrshire, where the dairy system is carried to greater perfection than in any part of Scotland, the farms are of a moderate size, in general from 50 to 150 Scotch acres, though there are some of a larger description, exceeding even 200 Scotch, or 252 English acres. On a farm of 100 Scotch, or 127 English acres, from 10 to 12 cows, (a number capable of being managed by one family with ease and economy), may be kept, and it will also produce other articles, besides what is necessary for their maintenance. In hard soils, and dry climates, grain husbandry is preferable; but in soft soils, and moist climates, whenever farms are of a moderate size, the dairy ought to be the principal object of the farmer. It furnishes regular and profitable occupation during the whole year to himself and his family. Cleanliness, so essential in this branch of husbandry, is more likely to be better attended to on a small scale than on a large one, and by persons interested in the sale of the commodities produced, than by hired servants or labourers. Where is this system indeed more likely to answer, than with the small farmer, whose cows are his pride, who takes a delight in shewing his stock to his friends when they visit him, in detailing the history of their lives, in dwelling on the condition to which he has brought them, and in pointing out the beauties of their progeny, and the excellence of their produce *?

In dairy farms, four objects may be attended to: 1. Selling the milk fresh from the cow; 2. Making butter;

* Aiton's Report of Ayrshire, p. 430.

3. Manufacturing cheese ; and, 4. Feeding the calf for sale. It will be proper to give a general account of the nature and profits attending each of these branches of the dairy system, as thence the proper size of a dairy farm may, in some degree, be ascertained.

1. In the immediate neighbourhood of towns or large villages, milk is sold in small quantities fresh from the cow ; and in this way more profit is derived from it than in any other mode. The price, when sold in villages, is commonly from 3d. to 4d. for two English quarts, or Scotch pint, and from 4d. to 6d. for the same quantity when sold in towns. Fresh milk is used with porridge or hasty-pudding, with bread, or potatoes ; and in this way it is not only much wholesomer than when used in any other mode, but goes much farther as food, one gallon of milk used fresh being equally nourishing as the cheese produced from two gallons, and the meat from the whey given to hogs *. No wonder then that labourers are anxious to have milk for their families.

2. Where milk cannot be sold fresh with advantage, it is generally converted, within any moderate distance of a town, into butter and butter-milk ; the first for the consumption of the upper ranks, the second as an important article of food for the labouring classes of the community. The art of making butter has of late been much improved in Scotland. In the western districts, it is generally made of the entire milk, and not of cream alone. By the adoption of that plan, the butter is not so rich, but is sound and good, and the butter milk is rendered peculiarly palatable and wholesome †. At the average quality of the milk of different cows, seven Scotch pints, or 3.18 English

* Aiton's Report of Ayrshire, p. 445.

† Ditto, p. 449.

gallons, make a pound of butter, (22 oz.), which sells at from 1s. 6d. to 1s. 10d. per pound; and when one pint of water is added to three or four pints of butter-milk, the whole will sell for 1d. per pint.

3. Ayrshire has long been famous for a mild and palatable species of cheese made from sweet-milk, commonly known under the name of *Dunlop* cheese, from the parish where it was originally manufactured. Mr Aiton, in his Survey of Ayrshire, states, that from 50 to 55 Scotch pints of milk, (from 100 to 110 English quarts), with the cream, will generally yield one stone of that cheese, Ayrshire weight, (24lb.), which sells at 14s. per stone *. Taking the average of 22 stones of cheese, from 1200 pints (or 2400 English quarts) of milk, the return will be about L.15 : 0 : 8 per annum, besides the value of the calves, and what can be made of the whey. This last article is used as food in the farmer's family, and is given as drink to the working people. It is also given both to horses and cows for drink; the cows give more milk when they get it. It is sometimes sold in towns at a penny per Scotch pint. When boiled, the float-whey at the top resembles curd. In country places distant from towns, it is now generally used in feeding swine. The whey produced from the milk of three or four cows, with a few vegetables and other offals, will rear a pig, in one season, from the value of 8s. to 10s. to the weight of 14 or 15 English stones. Butter is rarely extracted from the whey in Scotland, as is the case in some of the English dairies. Such butter is always of a very inferior quality; and, except in very large dairies,

* The price of the Dunlop cheese has recently fallen as low as 10s. per stone, but it is supposed will soon return again to its former standard.

is not an object to the farmer. For at an average of the qualities of whey, 22 ounces of this inferior kind of butter, are not obtained from less than 30 pints, or 14 gallons of milk.

Skimmed milk, or common cheese, is also made to a considerable extent in Ayrshire, from milk, the cream of which has been converted into butter. It is well worth trying, whether it would not be more profitable, instead of making the cream into butter, to mix the cream of the skimmed-milk, with a quantity of sweet milk, equal to that from which the cream was taken. By this means, cheese of the same quality with that of Stilton might be made, for in that consists the whole secret of manufacturing that high-priced article. By mixing a small quantity of butter with the curd of skimmed-milk, before it is put into the cheese-vat, very excellent cheese is made by some dairy-women.

4. The feeding of calves for veal is another mode of deriving profit from a dairy. This practice has been brought to great perfection in the counties of Ayr and Lanark. The calves receive no other food but milk as it comes from the cow, and which they are taught to drink from a dish, in general not being permitted to suck. The young calves are fed on the first-drawn milk, which abounds with serum or whey; the older ones get the last-drawn, which is much richer. It requires this rich part of the milk, of at least two or three cows, for several weeks, to bring a calf to the greatest pitch of fatness. The highest price given for a calf thus fed in Ayrshire, is from L.5 to L.6, to which value it may be brought, by proper management, in eight or ten weeks. In Lanarkshire, particularly in the parish of Strathaven, which is celebrated for its veal, calves have been fed to the value of L.10; but that may proceed more from ostentation than prudence, as the milk,

after the calf has been brought to a certain degree of fatness, may be applied to more profitable uses *.

Mr Aiton estimates the value of the produce of these cows, in different circumstances, at the following rates:

1. Value of 1200 Scotch pints, or 2400 English quarts, sold in villages, at from 3d. to 4d. per pint, or 2 English quarts, average 3½d.	L.17 10 0
2. Value of ditto, sold in towns at from 4d. to 6d. per pint, or 2 English quarts, average 5d.	25 0 0
3. Value of the same quantity employed in making butter and butter-milk, at 4½d. per pint, or two quarts,	22 10 0
4. Value of the same quantity made into sweet-milk cheese, at 3½d. L.15 : 8 : 4, with L.3 for the calves, and the profit to be derived from the whey,	18 8 4
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5. In regard to feeding calves, he calculates, that when the calf is of the most thriving kind, and properly managed, milk will bring a better return, when disposed of in that way than in any other, except when the milk is sold fresh in large towns.	

Besides the sums above stated, being the amount of the gross produce, according as the milk is disposed of, a dairy farm, when properly regulated, produces a variety of other articles. One-third, or at least one-fourth, of the farm ought to be cultivated as arable land, and a sufficient quantity of young cows ought to be reared to keep up the stock. The custom of providing clover, tares, &c. for

* Aiton's Ayrshire, p. 442, &c.

early summer food, and some turnips or cabbages for winter food, and some potatoes as spring food, is becoming more general in Ayrshire, greatly to the improvement of the dairy system.

Mr Aiton, who has paid particular attention to the subject of dairy farming, considers small farms as peculiarly advantageous for that branch of husbandry, because it is in the power of the farmer's wife or daughters to perform, or at any rate to superintend, the whole concern. No branch in agriculture requires such constant and unremitting attention as the dairy. If a few spoonfuls of milk are left in the udders of the cow at milking; if any one of the implements used in the dairy be allowed to be tainted by neglect; if the dairy-house be kept dirty or out of order; if the milk is either too hot or too cold at coagulating; if too much, or too little rennet is put into the milk; if the whey is not speedily taken off; if too much or too little salt is applied; if the butter is too slowly or too hastily churned, or if other minute attentions are neglected,—the milk will in a great measure be lost. If these nice operations occurred only once a month, or once a-week, they might be easily guarded against; but as they require to be observed during every stage of the process, and almost every hour of each day, the most vigilant attention must be kept awake throughout the whole season. That is not to be expected from hired servants. The wives and daughters of farmers, therefore, having a greater interest in the concern, are more likely to bestow that constant, anxious, and unremitting attention to the dairy, without which it cannot be rendered productive *.

* It is a practice in some parts of the country, to let cows by the year; the farmer furnishing merely the cows and their food, and the person

Another advantage derived from small dairy-farms is, that cows are much injured if they are compelled to travel far from the place they are milked to their pasture. It is found advisable, therefore, when a farm exceeds 200 Scotch acres, to erect two sets of dairy-houses to suit the different parts of the farm.

On the whole, the dairy is a beneficial system in the west of Scotland, where there is a great population, and a moist climate, and where the culture of arable land, under proper rotation, is still but imperfectly either understood or practised †. But in the eastern districts, the prices of butter and cheese must be much higher, in proportion to wheat, to beef, or to mutton, before it can merit any attention, since, from the minute attention it requires, the dairy is incompatible with an extensive scale of farming. In regard to light, dry lands, it is hardly consistent with the best rotations, and more especially with that excellent practice, the soiling turnips on the ground by sheep, by which a loose soil is consolidated.

who bargains for them attending to their feeding and the management of their produce; but that occasions frequent disputes between the parties.

† It is remarked, in a late communication from John Tennant, Esq. that the backward state of agriculture in Ayrshire, has been the great cause of raising the reputation of the dairy management in that county, as it is generally the best conducted part of the system; but when Ayrshire is enabled to approach the better improved districts in cultivation, there will be less said about the profits of the dairy; much depends, however, on the relative prices of the different articles produced. He adds, that the great obstacles to the improvement of that county hitherto, namely, the arbitrary restrictions of the leases, the small size of farms, and a deficiency of capital and skill amongst the farmers, are gradually giving place to more judicious and enlightened arrangements; so that Ayrshire is likely soon to deserve a more respectable place in the list of improved districts.

3. Farms adjoining to Towns.

In the neighbourhood of towns, farms are commonly from 100 to perhaps 200 Scotch acres, which is found abundantly sufficient for such occupations, though some may reach even 300. It is well remarked by a most intelligent correspondent, (George Rennie, Esq. of Phantassie), that farmers in the vicinity of large towns, may be compared to *retail shopkeepers*, whose attention must be directed to small articles, by which a great deal of money may be got, the greater part of which would be lost, without the most unremitting attention. The farmer at a distance from markets, who cultivates on a great scale, may be compared, on the other hand, to a *wholesale merchant*, who, as his profits are less, requires a greater extent of land, for the purpose both of engaging his attention, and of enabling him to support that station of life in which he is placed. There is this difference, also, between farmers in the neighbourhood of towns, and those who reside at a distance from them, that the former find it more profitable to sell their produce, even such bulky articles as turnips, potatoes, clover, hay, and straw, than to fatten cattle for the butcher; and they are enabled to do so, without injury to their farms, as they can procure dung in return, when these articles are sent to market.

As this is an interesting part of the investigation, it is proposed shortly to enquire into the following particulars :

1. What rents are paid for lands in the neighbourhood of large towns?
2. What rotations of crops will enable the farmer to pay such rents?

3. What are the advantages which farmers possess in the neighbourhood of towns ? And,
4. What political effect may result from such high rents being exacted from them ?

1. I have received from various quarters, statements of high-rented lands, not only near Edinburgh, but in the neighbourhood of other towns. The farm of Lairwell, for instance, near Perth, on the estate of Lord Gray, amounting to 100 Scotch, or 127 English acres, is let as follows :

Money rent.....	L.5	7	6
1 Boll (4 bushels) of wheat, supposed to be worth, at an average, 40s. per boll, or 10s. per bushel.....	2	0	0
Poultry and other articles paid in kind, sup- posed in all to be worth L.10, or per acre.....	0	2	0
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Total, L.7	9	6	

Which is equal to L.5 : 17 : 8 per English acre.

Within such a moderate distance of Edinburgh as from three to seven miles, L.7 per Scotch, or L.5, 10s per English acre, is not an unusual rent ; and the farm of Coats, consisting of 80 Scotch acres, situated about one mile from Edinburgh, some parts of it even nearer, is let at about L.8 per Scotch, or L.6 : 5 : 10 per English acre.

The farm of Clearburn, about one mile from the suburbs of Edinburgh, consists of 77 Scotch acres, and is let for L.9 : 16 : 8 per Scotch, which is equal to L.7 : 13 : 7 per English acre. It has the advantage of a good house, to which any person, taking such a farm, at such a rent, is well entitled. Such farms are often rented as a convenience by persons of property, who wish to live, at least occasion-

ally, in the country, and who take land, more as an accommodation and amusement than for profit,

A respectable proprietor near Edinburgh has recently let 33 acres, adjoining to the Water of Leith, at L.10, 10s. per Scotch, equal to L.8 : 5 : 1 per English acre, without any house, and was offered L.12, but preferred a tenant whom he knew to be unexceptionable; and he lately let about four Scotch acres at L.12, 12s., or L.9, 18s. per English acre. These sums are chiefly given by cowfeeders and butchers, who can afford to pay, from the nature of their business, and their contiguity to the Edinburgh market, such rents as no farmer, who had nothing but the cultivation of his land to depend on, could offer. Notwithstanding these high rents, some of these cowfeeders, by selling milk, have, within these few years, realized from L.1000 to L.3000 each.

2. The second head of the proposed enquiry, namely, the rotation of crops usual near Edinburgh, where the system of town-land farms is brought to the highest perfection, and where the highest rents are paid for land, shall now be discussed.

Within a mile of the suburbs of the metropolis, the ground is principally occupied in gardens, which sometimes let as high as L.16 per Scotch, or L.12 : 13 : 4 per English acre; or in fields of sown grass, commonly called grass-parks. Beyond that space, to the extent of about two miles and a half, some corn is raised, but the land is chiefly devoted to the production of such green crops as are generally consumed in the town and its environs, as clover, turnips, potatoes, cabbages, &c.; the expence of carriage making it less profitable to raise them at a greater distance. A species of garden culture seems to be best calculated for rendering the ground productive, in situations where markets are near, and manure at command, though it requires a degree of superintendence rather inconsistent with farm-

ing on a great scale. It is probable, indeed, that the common vegetables, necessary for the consumption of the inhabitants of towns, will soon be raised by farmers, instead of gardeners, (early crops alone excepted), as by farmers they can be produced at half the rate, owing to their less expensive mode of cultivation.

The most approved rotation, where land lies at from two and a half, to four or five miles from Edinburgh, is, potatoes *, wheat, and grass; and sometimes, after grass, oats. If the farm amounts to 60 acres, its average produce, and the value thereon, at the prices these articles now fetch, may be stated as follow :

1. 20 acres of potatoes, at L.19 per Scotch, or 4s. per English acre †,	L.380 0 0
2. 20 acres of wheat at 40 bushels of Scotch, or 32 bushels per English acre, at 10s. per bushel,	400 0 0
	—————
Carried forward,	L.780 0 0

* Ruta baga would also be a profitable article occasionally to cultivate in the room of potatoes, not only for the consumption of cows and horses, but as an excellent culinary vegetable; a very moderate average crop may be estimated at 20 tons, or 3200 English stones; and valuing the stone, consisting of 14lbs. at 2d. each, a crop of ruta baga, near Edinburgh, would be worth L.36 : 13 : 4 per English acre. A much larger crop, however, is often obtained. The yellow turnip is also entitled to the particular attention of the farmers near Edinburgh; also podded peas and beans, and collards, that is, young cabbage, plants of which (the sweetest of greens), are bundled together for spring use.

† If the land be properly manured and dressed, the potatoe crop should equal in value the crops either of wheat or of clover. It is said, that clover, after wheat and potatoes, often fails on strong loams, but that if the land be ploughed three times, and sown with barley instead of wheat, the clover is sure to succeed.

	Brought forward,	L.780	0	0
3.	20 acres of clover, sold for being cut twice, at L.21 per Scotch, or L.16 : 16 : 4 per English acre,	420	0	0
		L.1200	0	0

4.	Wheat straw, at 10 kemples (817 pounds Troy) per Scotch acre, or one kemple for four bushels, or one boll of wheat, at 9s. per kemple, is L.4, 10s. per Scotch, or L.3, 10s. per English acre,	90	0	0
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Total value of the produce, L.1290 0 0
 Which is at the rate of L.21, 10s per Scotch, or L.17,
 14s. per English acre. In 1809, the produce of this ex-
 tent of land was estimated at L.26 : 12 : 2 per Scotch, or
 L.20 : 18 : 4 per English acre.

It is to be observed, however, that in many cases, the crops of wheat in the neighbourhood of Edinburgh, and in fertile soils under the more improved systems of Scotch husbandry, produce more than 32 bushels per English acre. Sometimes 12, 14, and even 16 bolls per Scotch, or 38, 47, and even 55 bushels per English acre, have been obtained: 55 bushels of wheat at 10s. per bushel, is L.27, 10s.; and if every 4 bushels produce six shillings worth of straw, (for the straw is proportionably less when the quantity of grain is great), the produce per English acre, in straw, would be L.4 : 11 : 8, and the total produce L.32 : 1 : 8 per English acre. But as wheat is cheaper when the crop is abundant, let the wheat be stated at 8s. per bushel; the value of the produce will then amount to L.26 : 11 : 8 per English acre.

When oats are taken after clover, the average produce is from 12 to 14 bolls per Scotch, which is at the rate of

from 57 to 67 bushels *per English acre*. The value may be stated at from L.11, 8s. to L.13, 8s. *per English acre*. To these sums must be added the price of the straw, which is more valuable than wheat-straw, being reckoned more nutritious and palatable for cows and horses. It sells in Edinburgh at above 12s. *per kemple*, and consequently may be stated at L.9, 2s. *per Scotch*, or L.7, 3s. *per English acre*, making a crop of oats in all worth L.20, 11s. *per English acre*.

In light soils, where turnips can be raised, the crop, in common seasons, is reckoned worth L.20 *per Scotch*, or L.15 : 10 : 6 *per English acre*; but the value of a crop of turnips was greatly increased during the stoppage of distillation from grain, the cowfeeders being thereby compelled to try other articles for the maintenance of their stock during the winter season. The price then rose from L.26 to L.36 *per Scotch*, or from L.20, 9s. to L.28 : 6 : 3 *per English acre*.

In regard to the clover crop, it is to be observed, that there are a description of persons called grass-dealers, who buy from the farmers whole fields of clover. They cut it down gradually, according to the demand, making it up into small bunches, eight of which make what they call a load. The bunches, which have been of late greatly diminished in point of bulk, sell at 1 $\frac{1}{2}$. each, and consequently the load is a shilling.

3. We shall now proceed to state the circumstances which, in addition to such great produce, enable the farmers, in the immediate vicinity of Edinburgh, to pay their rents. In the *first* place, The turnips, potatoes, and the grass crop, are frequently sold *on the ground*, without any further trouble or expence to the farmer. In the *second* place, farmers near Edinburgh can purchase great quantities of manure, at a cheap rate, considering the crops

they raise, and the prices they obtain for them. Compost-dunghills, indeed, may be procured as low as four shillings per single-horse cart-load, thirty of which is reckoned sufficient to manure, not only a Scotch acre for potatoes, but also the succeeding crops, in the common rotation of potatoes, wheat, and clover, sometimes with the addition of oats. The total expence is only at the rate of L.6 per Scotch, or L.4, 16s. per English acre, besides the expence of carriage *. In the *third* place, Since the extension of Edinburgh, and the more luxurious mode of living adopted by its inhabitants, there is a ready sale, and a high price, for every article a farm can produce ; in particular, such great numbers of horses are kept, not only for carts and carriages, but at the artillery and cavalry barracks erected in the neighbourhood of the town, as to occasion a great demand for hay, straw, &c. And in the *last* place, The vicinity to the town, is a great convenience to the farmer, as corn and fodder, and every other article to be disposed of, can be carried more expeditiously to market, and consequently at less expence, and the payment is immediate.

4. It may be proper, in the next place, to consider the political effect which results from the high rents paid for lands near towns. Such rents, and the great competition, where produce can, with certainty, be disposed of, evi-

* This must vary much, according to the distance, insomuch that it may become 130 per cent. dearer to one farmer than to another. If it is driven eight miles from town, a man and two single-horse carts can do no more than bring home one turn in a day. Allowing, therefore, 16s. for the man, the two horses, and the two carts, and 8s. for the dung, the total is 24s. or 12s. per single-horse cart-load laid down on the land ; whereas, farmers within a mile of town can lay down at 5s. 4d. a-cart, at six turns a day.

dently tend to diminish the size of farms of this description. There are few who would wish to have above from 100 to 200 acres in their possession, upon the short leases usually near towns, and when the farmer must pay at the rate of from L.7 to L.10, or even as high as L.12 per acre, and must frequently be disposing, in small quantities, of the articles produced on his farm. Hence it is that in Flanders, which is full of large towns and villages, from the existence of similar circumstances, the farms are small.

In less populous parts of the country, it can hardly be questioned, that large farms are necessary, to furnish sufficient employment to industrious, opulent, and intelligent farmers: but near towns, from the greater produce, the constant cropping, and the more rapid sale, farms of a smaller description will answer the same purpose; and it is certainly for the advantage of such towns, that the farms in their neighbourhood should be of a moderate size. When there are a great number of farmers, there will be more competition; lesser objects will be attended to, and the markets will be more regularly, and better supplied.

4. *Clay-land Arable Farms.*

In a valuable work on agriculture, recently published, it is justly remarked, that where agriculture is followed as a distinct profession, a farm ought to be of such a size, as to furnish regular employment, not only to the farmer himself, but also to the servants and labourers employed by him, in order that the greatest possible profit may be derived from their labour, at the least possible expence. It is evident, that this can only be accomplished on a farm of considerable extent, where judicious rotations of crops can

be adopted, and where the economy of the farm is so conducted, that too much work does not occur at one season of the year, and too little at another; in short, where that division of labour, from which manufacturers have derived such essential benefit, is extended to husbandry *.

To manage a strong-land, or clay farm, properly, requires great attention, and the almost constant personal vigilance of the farmer in superintending the various operations which must necessarily be carried on.

There are four circumstances on which its size ought in a great measure to depend, which, though not peculiar to this description of farms, it may not be improper, from the importance of the subject, here to enumerate : 1. The situation of the farm-house and offices, from which no part of the land ought to be too distant; for it is desirable that no time should be wasted, either in conveying manure to the remotest part of the farm, or in carrying home the crop. Where the house and offices are in a central situation, the farm *may* consist of 500 or even 609 Scotch, from 635 to 762 English acres, without much inconvenience in that respect; but where a farm is of smaller dimensions, say from 300 to 400 Scotch, or from 381 to 408 English acres, the operations may, in general, be carried on under the more immediate inspection of the farmer. 2. It seems to be universally admitted, that no farmer, on such land, ought to have less than six two-horse ploughs; to give full occupation to each of which, 50 Scotch, or $62\frac{1}{2}$ English acres, may be assigned, which would make in all a farm of 300 Scotch, or 381 English acres. 3. A

* See a Treatise on Rural Affairs, in two volumes octavo, by Robert Brown, farmer at Markle, county of Haddington, so justly characterised by Mr Curwen as an excellent theoretical, as well as a practical farmer. Report to the Workington Society, anno 1810, p. 87.

clay-land farm ought also to be so large, as to justify the expence of erecting a threshing-mill, on a proper and substantial construction, to go by water, by wind, by steam, by oxen, or by horses. 4. The size of such a farm ought likewise, in some degree, to depend, on the state of the roads in the neighbourhood, its distance from markets, and above all from lime, that most essential article for the proper cultivation of strong land.

Taking all these circumstances into consideration, although an active and intelligent farmer, with a large capital, and with other advantages, may be able to manage a clay farm of 600 Scotch, or 762 English acres, and several individuals of activity, skill, and capital, have successfully managed even larger occupations ; yet, on the whole, about 300 Scotch, or 381 English acres, is, in general, sufficient ; and it has been remarked, that those who grasp at having farms of a greater extent, where servants are not immediately under the master's eye, oftener lose than gain by extending their concerns. Such a farm as 300 acres, may, with propriety, be divided into six, seven, or eight fields. The establishment requisite for it will be sufficiently extensive for carrying on every operation, (reaping excepted), without additional assistance, and the fields may be so laid off, as not to extend beyond a reasonable distance from the farm-house and offices. On the other hand, where a greater quantity of ground is combined into one farm, the fields must be more extended, and the expence of labour increased, from the distance between the farm-offices and the ulterior divisions, by means of which a greater establishment will be required to bring home the produce, and to take out manure ; much time also will be unprofitably consumed in going to, and returning from the fields, and, as in rainy weather, the ground will be greatly cut up by these operations, much additional labour

will therefore be required, from the necessity of taking lighter loads.

In regard to clay farms, consisting of less than 300 Scotch acres, they do not afford sufficient employment for a person possessed of capital, abilities, and activity. The farmer therefore generally employs himself as a working-grieve or overseer; and servants accustomed to his presence and aid, when they happen to be left to themselves, idle away their time, or commit blunders. There is still a greater objection to the smaller size of farms, that the stock of men and horses kept is not equal to execute, by themselves, any work that requires dispatch, such as the bringing home of a cargo of lime, the carriage of a dunghill from town, the delivery of a large quantity of grain upon short notice, the leading grain into the stack-yard after bad weather, also keeping the proper season of ploughing, sowing, or harrowing any ticklish field upon the farm; all these difficulties can be surmounted, if the stock and farm are large, and the other operations of the farm go on smoothly at the same time. It may be laid down, therefore, as an axiom regarding clay-land occupations, that a farm of a proper size, say 300 Scotch, or 371 English acres, can be cultivated with considerably less stock, and every way at less expence, in proportion to its size, than one of smaller dimensions.

5. *Turnip-land Arable Farms.*

Where the soil of a farm is of a light description, a larger extent of land is necessary, as, in such soils, sheep and cattle are not only fed off in greater numbers than in the clay-land districts, owing to the quantity of green food they produce, but also because stock is sometimes bred in

considerable quantities, and a large proportion of the farms ~~is~~ kept in pasture. On such soils, therefore, a farm of ~~From~~ 600 to 1000 Scotch, from 762 to 1270 English acres, ~~has~~ not been considered too large; and where it is entrusted to a skilful and active farmer, such an extent is not disadvantageous either to him, to the landlord, or to the public. In some instances, indeed, persons of uncommon abilities, have successfully held, in the more southern districts, even larger occupations of turnip soils; but, in general, the difficulty in procuring manure for extensive fields of turnips, and of carrying out the dung from the farm-yard to the fields, tend greatly to limit the turnip-farmers of Scotland, to occupations of a moderate extent.

It has been much contended, whether it is necessary, on such extensive farms as those of 1000 Scotch acres, to have two sets of offices. They certainly ought to be avoided if possible; and if the farm-yard is fortunately situated in the centre of the farm, one set may be sufficient, though, in that case, the more remote fields of the occupation are seldom so properly attended to, and consequently are less productive and valuable. It is a great advantage, however, attending a turnip soil, that the green crops may be consumed on the ground, and that no expence of conveyance is necessary.

6. *Commercial Farms.*

If the idea be well founded, that agriculture should not be under more restrictions than manufactures or commerce, but that any extent of land should be occupied, in proportion to the skill, abilities, and capital of the farmer; in that case farms of still greater extent than even 1000 acres of arable land, cannot, in particular instances, be

objected to, though such extensive tracts of land, in the occupation of one farmer, are not in general to be recommended. To such farms, the name of *Commercial** may be given, as they often resemble more the bold speculations of a merchant, than the cautious undertakings of a mere practical farmer. Such farms, more especially in turnip soils, may extend from 1000 to 2000 Scotch, or from 1270 to 2540 English acres. The most extensive union of farms in the Lothians contains 1800 Scotch acres arable land, at a rent of L.5660 *per annum*. The sowing of the whole farms thus occupied, is generally in the following proportions :

	Scotch acres
Wheat,	300
Barley,	120
Oats,	300
Peas and Beans,	120
Turnips,	200
Potatoes,	30
	<hr/>
	1070
In clover or pasture,	730
	<hr/>
Total,	1800

* The term *Commercial* may be objected to ; but why not the commerce of land as well as that of corn ? And may not the raising of corn be called a species of *manufacture*, and the most important of any ? Indeed, some maintain, that all farms should be, strictly speaking, *commercial* ; and that the soil will never be improved to its highest pitch by tenants, until all feudal ideas of favour to the present occupiers, and of the hardships of removal, &c. are totally laid aside, and leases are founded, on a perfect reciprocity of interests, as in any other mercantile transaction.

In the family of the same tenant, there is an additional farm of 400 acres, at the rent of L.1800 a-year, making the total amount of the rent paid by one family L.7460 *per annum.*

7. *Pasture Farms.*

Where farms, as is usually the case in hilly districts, are almost entirely employed in pasturage, or in the breeding of sheep or cattle, there can be no precise limits to their extent. A proprietor of an estate in the north of Scotland, had once a farm in his own hands, which he was converting from the rearing of cattle to the breeding of sheep, on which he had above 6000 Cheviot sheep, and the farm amounted to above 25,000 English acres. In some parts of the Highlands of Scotland, sheep-walks still more extensive are to be met with.

8. *Farms for Accommodation or Amusement.*

It is not only a healthy, but a useful employment, for gentlemen residing in the country, to have some land in their own possession, for the purpose of accommodation or amusement, and to provide themselves with the various articles which their families may require. Perhaps those articles might often be purchased fully as cheap at market; and it might be more profitable to the proprietors, to let the land at a fair rent; but it would be highly unpleasant for any gentleman, to have the servants of another, over whom he could have no controul, working constantly near his own house, and to have scarcely a spot he could call his own, on which he or his family could take air or exer-

cise *. What the extent of such farms should be, it is not necessary to discuss, as so much must depend upon the establishment kept by the proprietor, the time he resides in the country, and the degree of attention which he can give to his farm.

9. Farms of Experiment and Public Utility.

Since the attention of the public has been so much directed to agricultural pursuits, many respectable proprietors of land in England, among whom I with pleasure enumerate the Duke of Bedford, the Earl of Egremont, Lord Somerville, Mr Coke in Norfolk †, Mr Western in Essex, Mr Curwen in Cumberland, and many others who might be named; and several in Wales, as Sir W. W. Wynne, Sir Robert W. Vaughan, &c.; have cultivated extensive tracts of country, with the view of trying useful

* Mr Kerr, in his Survey of Berwickshire, p. 51, justly observes, that there cannot be a more rational, or more continually varying and amusing occupation of time, for the retirement of a country gentleman, than the detailed superintendance of agricultural pursuits, united with attention to the improvement and embellishment of his estate, by inclosing and planting.

† Some Scotch farmers went to examine the husbandry of England. On their return they declared, " That after having visited all the principal counties in England, they returned perfectly satisfied in their own minds, that every thing that an agriculturist could wish to see, was to be met with at Holkham, where every branch of husbandry was conducted with the greatest regularity, and on the most improved principles." What an eulogium on the intelligent owner of that noble property !

experiments, and disseminating a knowledge of agriculture in their respective neighbourhoods.

Nothing can be more laudable than such exertions ; and the spirit of improvement which they have thus excited in all the adjoining districts, and the important facts thence brought to light, is the best recompence for all their labours. At the same time, even such efforts cannot compensate for the want of "Experimental Farms," under public patronage, and devoted exclusively to the ascertaining of useful facts by accurate experiment, continued as long as may be necessary. The establishment of even one farm of that description, on a proper scale, would be more valuable to this country, than the conquest of many distant possessions †.

On the whole, leaving out the three last descriptions of farms, as it is so difficult to assign any particular limits to their extent, the following table will give some idea of the sizes, which, in favourable circumstances, may be adopted, in regard to the other sorts.

† Without experimental farms, carried on either by great associations, or at the public expence, theory on the one hand, and prejudice on the other, will long prevent agriculture from being reduced to a science. Experimental farms, properly conducted, would remove every doubt on the subject ; and every material improvement, in the management of arable and grass land, in machinery, or in regard to live stock, would be speedily adopted. There are a great many desiderata, particularly with regard to live stock, that will not be fully determined, without such farms, for many years to come, and respecting which conjecture, or at most probability, must in the mean time supply the place of established facts.

English acres, omitting fractional parts.		Scotch acres.
62	1. Small farms, under.....	50
62 to 254	2. Dairy farms, from.....	50 to 200
272 to 371	3. Town farms, from.....	100 to 300
371 to 762	4. Clay-land farms, from.....	300 to 600
762 to 1570	5. Turnip-land farms, from.....	600 to 1000
1270 to 2540	6. Commercial farms, from.....	1000 to 2000*

It is hardly possible to suppose, that any one can be so absurd as to imagine, that the extent of farms specified in the above table, ought to be considered as precise standards, to be rigidly adhered to in all cases whatever. It is merely intended to explain, what, *in general*, may be adopted, where the skill and capital of the farmer, will enable him to do justice to such occupations, and where other circumstances are favourable.

Some are apt to consider large farms as hostile to population, and in other respects prejudicial to the public interests. Let us consider how far such objections are well founded.

With regard to large farms having a tendency to diminish population, such an idea has no just foundation, and indeed can never happen under an improved system of

* Some would recommend the division of arable farms into three classes : 1. Small farms, under 200 English acres ; 2. Moderate-sized farms, from 200 to 500 ; and large farms from 500 to 1000. Such is the diversity of opinion on this most interesting subject. It has also been observed, that in many parts of England, dairy farms are of a larger size than those above described ; and that in the northern counties of Scotland, a turnip-land farm, where the valleys are narrow, is seldom found to exceed 300 acres.

agriculture, where a proper proportion of the land is cultivated by the plough, and where it is the practice to have *married servants*, on the footing which will afterwards be described in Dissertation III.

In Mr Robertson's valuable Survey of Mid-Lothian, printed in 1795, it is distinctly stated, that upon the farm of Granton, then possessed by himself, containing about 250 English acres, in consequence of the junction of three farms *into one*, the population had increased from 40 to 70 souls. It is remarked by the same intelligent farmer, that on small farms, there are seldom any houses or cottages but the farmer's own, all his assistants being unmarried. Where there are great farms, on the other hand, cottagers abound; all the labourers are married, and have families: hence population must increase.

As it is seldom, however, that the former state of the population on a farm can be exactly ascertained, it may be sufficient to consider its actual amount on some great farms at this time, which will furnish data to calculate the amount of agricultural population in a well-cultivated district, under a proper system of management.

Mr Brown, at Markle, in East-Lothian, on a farm of 536 Scotch, or 670 English acres, had, in 1802, a population of 102 souls, which, in 1809, was reduced to 91; entirely owing to the families of some of the servants growing up, and removing to other places.

Mr Somerville, at Athelstanford Mains, in East Lothian, has, on his farm, containing 608 Scotch, or 772 English acres, a population of 92 souls, occupying twenty separate houses. His servants have a number of children, some of them seven or eight, all of whom are usefully employed in agricultural service.

On the farm of Mr Rennie of Phantassie, in East-Lothian, amounting to 553 Scotch, about 702 English acres,

the population amounts to 163 souls. Six of the binds have six children each.

Mr Nisbet, on his farm of Redden, in Roxburghshire, which amounts to about 1000 English acres, has 150 souls, and some of the binds have seven, eight, and nine children.

But the most striking instance reported to me of agricultural population, and of its increase, owing to a great extent of land, formerly divided into small farms, but latterly coming into the possession of one individual, is on those occupied by that intelligent and respectable farmer, Mr Walker of Mellendean, in Roxburghshire, of which he gives the following most satisfactory statement:

STATE of the Population of the Farms occupied by Mr Walker, when he entered into possession, on the supposition that each family consisted of five persons.

Entr y	Families.	Souls.
1787. Caverton and Backedge.....	16	80
1789. Mellendean.....	13	65
1803. Softlaw and Middlemost walls.....	8	40
1808. Rutherford, Broomhouse, &c.....	30	150
	67	335

In order to remove every doubt, regarding the amount of population at this time, Mr Walker, in August 1813, was at the trouble of making an exact enumeration of the names, situation, and number of souls in each family, in the different farms possessed by him, and certified by the respective stewards of each farm. The following is an abstract of that enumeration:

	Householders.	Souls.
1. Rutherford,	43	218
2. Softlaw,	20	105
3. Mellendean,	26	125
4. Caverton,	16	86
 Population, <i>anno 1813</i> ,	105	534
Former population,	67	355
 Increase,	38	199

So great an increase proves, that large farms, under a proper system, are favourable to population.

The population amounts, on an average, to five *per family*, and there are nine over. But many of the hinds, and other labourers, have eight, nine, and ten, in their families, and two of them have twelve.

It is proper, however, to state, that the population on the farms occupied by Mr Walker, amounting in all to 105 families, are not exclusively employed in their cultivation. Upwards of one half of them consist of weavers, masons, and labourers of various descriptions, who, except in time of harvest, (when all turn out who are able to wield the sickle), only furnish a young girl or lad, when wanted, for every kind of field-work, at 1s. *per day* in summer, and 10d. *per day* in winter. The number of families who are constantly employed on the farms, and who thence exclusively derive their maintenance, may be stated at fifty. Encouragement is given to the remaining householders in various ways, every one of whom has a garden attached to his house, likewise a considerable quantity of potatoes and flax raised in the fields, and coals carriage free; all these articles, with the victuals they receive in time of harvest, and the wages of the girl or lad at

other seasons of the year, may be considered as equal to one-fourth part of their annual maintenance.

It appears on the whole, from these returns, that the extent of land possessed by these five farmers, amounts to something more than 6000 English acres, and that the population is 1026, or about one soul for every six English acres, (rather more than 106 per square mile), without any common being attached to their farms, as is frequently the case in regard to small farms.

It would likewise have been extremely desirable to have ascertained the surplus produce, or the quantity of human food sent to market, after feeding the population on these farms; but various circumstances render it hardly possible to make such a calculation with any thing like minute accuracy, especially when it is to be applied to different farms, of different soils, and under different management. I have much pleasure, however, in presenting to the reader, an abstract of a return transmitted to me, by a respectable farmer, Mr Brown at Markle, who possesses 670 English acres of land, chiefly kept under arable husbandry, and the population of whose farm amounts to 91 of all ages. Such an abstract, I trust, will answer every useful purpose, in regard at least to the surplus produce of that important species of occupation, clay-land farms.

“ According to the most accurate calculation in my power, the produce of eighty English acres, of tolerably good land, is required to support the population of this farm. These acres are appropriated in the following manner :

1. Twenty acres in grass for milch cows.—*Note.* The produce of forty acres, besides straw in winter, is consumed

by milch cows; but as one half of the cheese and butter manufactured from the milk of these cows is carried to market, only twenty acres are charged to the account of home consumption.

2. Twenty acres in oats, the produce of which is consumed in meal, in the shape of pottage or hasty-pudding, by the servants of the farm and their families, or by the shearers (reapers) in harvest.
 3. Ten acres in barley, the produce of which is used upon the farm, either as pot barley, or manufactured into meal, or malted and used upon the farm in harvest-time.
 4. Six acres in peas and beans, the produce of which is manufactured into meal, and used with part of the barley as bread by the servants.
 5. Six acres in potatoes.
 6. Three acres in garden ground.
 7. Seven acres in wheat.—As wheat bread is purchased, not only for my own family, and for the use of the reapers in harvest-time, but also occasionally by the married servants, I am inclined to think that the produce of seven acres may be charged on that account.
 8. Eight acres in grass for feeding beef and mutton, mostly used by my own family, with a small quantity by the married servants, I here estimate that eighty stones of beef and mutton, Amsterdam weight, are annually consumed upon the farm, and that it will require, upon an average, eight acres of grass to produce that quantity of beef and mutton, over and above the original weight of the animals when purchased."
- " From the above it appears, that the produce of 80 English acres of ground is required to support the population of this farm. It may next be added, that the produce of 90 acres is consumed by the working, supernumerary,

rary, and saddle horses, viz. 40 in grass, tares, and hay, and 50 acres in oats; and that, on an average of years, the produce of 45 acres is used as seed-corn. About 100 acres or thereabouts are annually unproductive, that is, in summer-fallow, in grass upon which young horses are reared, or occupied by fences, roads, water-runs, stack-yards, and other purposes, from which no direct produce is returned. These, with four acres in flax, given to the servants as a part of their wages, amount in all to 319 acres, which, deducted from 670, the total number of acres in the farm, leaves a balance of 351 acres for raising disposable produce."

" Of the acres carrying disposable produce, 20 have already been accounted for, as devoted to the feeding of milch cows, one half of the cheese and butter manufactured from their milk being estimated as going to market. About other 70 acres are kept either in pasture grass for sheep, or used for soiling cattle in the yard, and 30 acres in turnips. Thus the number of acres in grass and turnip for feeding cattle and sheep, is 122; and if this is subtracted from the above balance of 351 acres, it will appear that there remain 229 English acres upon which disposable grain can be cultivated.

" With regard to the produce of these acres, it is difficult to speak with the slightest precision, because it varies from year to year, according to the goodness and badness of the season: while at the same time it deserves attention, that every deficiency of produce, in the acres set apart for supporting home population, and raising food for servants, horses, and seed-corn, must be made up from this surplus. Generally speaking, the surplus corn may be estimated at something more than four quarters *per acre*, or 950 quarters altogether, after the acres appropriated to

home consumption and fattening live stock are deducted."

" As a part of the turnip crop is consumed by the milch cows of the family, and by breeding ewes in the winter months, the return from feeding stock may be stated at 800 stones, Amsterdam weight, *per annum* of beef, mutton, and lamb, over and above the weight of the cattle and sheep when purchased, and about 150 stones of pork, fed in the straw yard upon the offals of corn, &c. I have no *data* for estimating the quantity of butter and cheese sold, as most of the butter belongs to the servants; but if the whole is rated at 70 Scotch stones, of 28 avoirdupoise pounds, I suppose a great error will not be committed."

The above return is very satisfactory, as it throws much light on the internal economy of arable farms, respecting which so little information has hitherto been communicated to the public. It required indeed a degree of intelligence, of ability, and of public spirit, rarely met with in the same individual, to draw up such a statement, and to induce the author to agree to its publication.

On the farms of Mellendean, &c. occupied by Mr Walker, which are principally of a light turnip soil, the produce of land in cultivation is proportionally less, not being so fertile; but as naked fallows are unnecessary in turnip soils, there is a greater proportion of land under grass or green crops, and the produce of meat is higher. According to Mr Brown's calculations, his farm, containing 670 English acres, furnishes, on an average, a surplus produce of 950 quarters, or, at eight bushels *per quarter*, 7600 bushels. It also furnishes 950 stones, Amsterdam weight, of beef, mutton, lamb, and pork. This is at the

rate of nearly eleven and one-half bushels, and about one stone seven pounds of butcher meat, of surplus produce, for every acre on the farm. On the other hand, Mr. Walker, on 2866 English acres of turnip soil, calculates, that there is a surplus produce of 3551 quarters of grain, and about 7000 stones of butcher meat : consequently the surplus produce, *per acre*, owing to fallows being unnecessary, is nearly ten bushels of grain, whilst about two stones seven pounds of butcher meat, English weight, (or two stones Amsterdam), is produced *per statute acre*.

When all these circumstances are taken into consideration, can it be questioned whether large farms, under an improved system of cultivation, instead of being hostile, are not even favourable to population, furnishing, at the same time, an immense supply of surplus produce ; and I should be glad to know, whether any branch of domestic industry, or of foreign commerce, can, in any other respect, be compared with **THE CULTIVATION OF THE SOIL, AND THE IMPORTANCE OF ITS PRODUCTIONS ?**

We shall now proceed to state the various advantages resulting from large farms. These may be classed under the following general heads : 1. When the farm is of a proper size, (from 300 to 600 Scotch, or from 381 to 762 English acres), less expence is incurred in building houses and offices, and in keeping them in repair, than if the farm were divided, and two sets of houses, &c. were erected for the accommodation of two or more farmers ; at least that is generally the case, though some large farmers go beyond all bounds in the accommodations they require. 2. The inclosures on a large farm are on a larger scale, and are originally made, and afterwards kept in repair, at a less expence ; much ground is thus added to cultivation, and less shelter is given to the vermin with which hedges and walls abound. 3. There is also a saving of expence

in house-keeping, when two farms are united into one, the amount of which must vary according to circumstances. 4. The saving in the expence of cultivation is considerable. When a farm of 200 English acres is united to one of 330, the work of a pair of horses, and a ploughman, will be saved; fewer instruments of husbandry are also necessary; in particular, one threshing-mill will be sufficient. 5. The land is much better cultivated, more effectually drained, and more improved by extraneous manures, which small farmers cannot afford to purchase to any extent, or to convey to any distance. 6. A much greater quantity of disposable produce, as appears from the preceding statement, is sent to market. The small farmer and his family, indeed, consume so much of the produce of the land they occupy, and raise so little, that the surplus is inconsiderable. It is only by means of large farms, that great towns or populous districts can be supplied in sufficient quantities with such articles of primary necessity, as grain, butcher meat, &c.; in regard to butcher meat in particular, it is generally sold by the large farmer in a fattened state, which is seldom done by the small farmer. 7. The live stock on large farms is confessedly of a superior quality, because a large farmer can afford to purchase the best sorts, and to maintain them afterwards; the instruments of husbandry are likewise of a more improved description, and capable of performing their work in a better manner. 8. The labour on a large farm can be better subdivided than on a small one*, by means of

* In the cultivation of turnips, for example, the first forming of the drills, the carting, spreading, and ploughing in of the dung, and the sowing of the seed, ought all to be going forward at the same instant, in order to ensure success. But on very small farms, these different operations

which critical periods may be caught, more strength of labour can be applied to particular parts of the farm when wanted, and the work may be done better, and with more expedition, in an adverse season. 9. The large farmer has full employment, independent of manual labour*. He has enough to do, superintending others, instead of working with his own hands; for whilst he busily employed himself at a particular job at one part of his farm, his servants may be completely idle at another. It is in consequence of having full employment, that he is not under the necessity of engaging in other undertakings, which not only abstract his attention from his farm, but may also be attended with real loss†. 10. A farmer with a large capital has enlarged ideas, which expand with the extent of his possessions: He has a superior education, and understands better every branch of his profession; He has more enterprise, and having fewer prejudices to subdue, he is more ready to adopt new improvements:

must of necessity be accomplished in succession; hence, in a droughty season, not only is the soil itself robbed of its moisture, but the dung, from lying spread along the drills, is exposed to the rays of a scorching sun, and is frequently rendered so dry, as to be of very little service to the plants, during the first stage of their growth; nay, may even operate against the vegetation of the seeds, by keeping the soil immediately under them too open.

* Men of genius and enterprise will not be confined to small farms, such as those which prevail, for instance, in some parts of Stirlingshire, &c. They speculate on something else, as black-cattle, horses, grain, &c. &c. and look upon their farms as a secondary and unimportant concern.

† Since rents, and the expence of cultivation and of labour, have so much increased, a person of education and character cannot live respectably, or even with comfort, on a small farm, and must look out for some other means of subsidiary occupation.

He is able to travel about to obtain useful information, to educate his family better, and in every respect to render them more useful members of society. 11. On a large farm a greater variety of practice can be introduced, such as pasturing a proportion of the farm alternately; and whilst the large farmer may be both disposed and enabled to change his intended system, should an unfortunate season, or some other incident, render it necessary, the farmer on a limited scale must continue in the trodden path, often in opposition to the true principles of his profession. 12. Large farms are favourable to the improvement of land in an inferior or waste state. The small farmer generally leaves it as he found it; whereas, when a great farmer, with a considerable capital, gets such land into his possession, on an improving lease, he soon renders the waste nearly as valuable as the old cultivated soil *. 13. Large farmers, when they are active, spirited, and intelligent, are the fittest persons to try experiments, and to prosecute them to the necessary extent; small farmers cannot afford it, and gentlemen farmers, though there are exceptions to the rule, seldom give that unremitting attention so necessary for ensuring success. 14. Many operations on a large farm can be done better, and, in proportion to their importance, at a cheaper rate, than on a small one. For instance, where a large flock of sheep are kept, or a number of cattle, careful and intelligent servants may be hired for attending them, which no farmer on a small scale can afford. A large farmer can also sell at market, in the same space of time, ten times the number of cattle or sheep, or ten times

* When persons can be prevailed upon to take small portions of waste land (from two to six acres) to improve, they often do it effectually; but small farmers rarely add to the arable land in their possession.

the quantity of grain, that any small farmer can have to dispose of. 15. The large farmer, possessed of all these advantages, can in general also afford to pay a higher rent, and, from the capital or credit he possesses, with more punctuality, than the small farmer, from whom the rent he agreed to pay cannot often be exacted without compunction. 16. The large farmer pays more taxes to government for his house, and every article of his consumption. Indeed, farmers whose rents are under £ 50 a-year, are considered by parliament, and justly too, to be in so humble and poor a state, that they are not made liable to the payment of the income tax *,—and if all the farms in the kingdom were under £ 50 *per annum*, government would not draw a single shilling from the occupiers of land. In the last place, Respectable farmers, possessing that species of independence which a lease furnishes, are a most important link in the great chain of society, not to be found in any country in the universe, Great Britain alone excepted,—a class, whose habits of industry, intelligence, and spirit, and the extent of whose capital, which it has required centuries to accumulate, form a species of bulwark, materially tending to preserve the existing order of society ; but if that bulwark, which it might be difficult now to overthrow, were once laid prostrate, it would baffle

* The following description of the situation of a small farmer, by Mr Walker of Woodon, will fully justify this exemption : “ In every instance I have met with, where a person occupies such a quantity of land as 50 acres, merely as a farmer, without any other employment, I have uniformly observed, that the occupier could with difficulty live by his profession ; that his lands were always in a wretched condition, and of course very unproductive ; and that he and his family drag on a very uncomfortable existence, in constant trouble and perplexity.”

human policy, without the existence of similar circumstances, ever to renew.

When all these particulars are considered, and when to them it is added, that population, as well as produce, is in general increased by large farms, under an improved system of agriculture, there seems to be little doubt, which description of farm is best entitled to encouragement, and is the most likely to promote the public advantage.

There is an important subject of discussion, connected with the size of farms, of which it is necessary here to take notice, namely, Whether it is proper that any farmer should be suffered to occupy more than one farm, or to possess what in England is called an off-farm, and in Scotland a *led-one*? There is much to be said in favour of the practice. Though a farm of a moderate size may be sufficient for a person possessed of moderate talents, and of a small capital, yet where great talents and a great capital are united, there is no reason why ample scope should not be given, for the exertions of which such an individual is capable, and why he should not be permitted to extend his pursuits. Such additional farms are rarely taken but by able and spirited cultivators; and it would be bad policy, to limit such men to the cultivation of the single spot on which they happened to be originally set down, to curb or palsy their exertions, or to fetter their free agency, where their actions do not endanger the happiness of society. It is also said, Why should agriculture, in point of extent, be more limited than commerce? And in regard to led or off-farms in particular, it is contended, that it is hardly possible for farming to be carried on with spirit, or to any great extent, where they are prohibited. A person, for instance, possessed of £10,000 of capital, is desirous of following agriculture as a profession. He takes a farm of 500 acres, on a lease of 19 or 21 years. He lays

out £.5000 of his capital in stocking and improving that farm ; but if he has no other land in his occupation, as a place of refuge, he is entirely dependent on his landlord, who, at the termination of his lease, may deprive him of his farm on very short notice, and when it may be impossible for him to provide himself with another. Unless, therefore, he is in the actual possession of another farm, he may be under the distressing necessity of selling off the whole of his stock, and abandoning his profession ; whereas with a led, or off-farm, he may still retain the stock on that part of his occupation, though he may be obliged to sell off the rest *.

These led or separate farms are generally entrusted to farming stewards, and being usually at no great distance from the farmer's residence, are managed under his inspection, and in general advantageously. Hence, though it is certainly desirable, that every farm, of a proper size, should have a separate possessor, yet there are cases, at the same time, where a departure from that general rule may be admissible †, more especially when farmers go from

* Mr Bailey of Chillingham remarks, that a tenant, who has a farm of strong loam, upon which he cannot grow a sufficiency of turnips, can afford more rent for a farm of turnip soil, than any tenant who had to reside upon it, and had no other farm.—It is likewise obvious, that a high sheep farm is not safe, and far less commodious, without a low farm, or at least winter pastures annexed to it. Another correspondent observes, that one farm may be better adapted for keeping winter stock, another for summer ; one for breeding, and another for feeding ; or on one farm the pasture may fail, whereas on another it may be abundant. He adds, that he has frequently found the benefit of all these circumstances.

† One of my farming correspondents has explained his sentiments on this subject, in the following terms :

“ I now beg leave to give my humble opinion respecting the resolu-

well-cultivated districts, which is sometimes the case, to improve the barren; or where opulent sheep-farmers, in the more southern districts, take extensive tracts of country in the north, for the purpose of breeding more improved kinds than were formerly to be met with there, by means of which the value of these distant regions is greatly increased. Peculiar attention is necessary to enforce improvements, in regard either to stock or culture, in cases of that nature; and where there are two sets of houses and offices, it is essential for the interest of the landlord that both should be kept up, in case a division of the farm

tions which some proprietors have entered into, of insisting on *residing tenants*, which I am of opinion is very much against their own interest; as well as a check to farmers of enterprise and capital. For instance, a farmer has a farm of 100 acres, but has a capital to stock another farm of 100 acres more, which is in his neighbourhood, and which he could manage equally well as his own, and of course could give a greater rent for it, than any other person, who might be obliged to reside upon it, having no family to keep. But as residing tenants are insisted on by both landlords, it is out of the question. The farm is therefore let to a farmer, probably 10s. or 20s. per acre cheaper, than the other farmer would have given. The person that gets it, perhaps hardly maintains his family upon it, whereas the other would have made money, not having a family to keep; the landlord would have got more rent, and the residing tenant would have turned himself to some other useful employment, or got another farm. Nor is this all. The farmer with the accumulated stock, may perhaps embark it in a business that he knows nothing about, or perhaps lend his money to the residing tenant, who, from the smallness of the farm, is unable to make any thing of it; and in either case, a heavy loss is sustained by an industrious farmer, who might have made, on different principles, a moderate fortune." There is a difficulty in this case regarding keeping up the buildings, where they are erected on separate properties. If none exist, it is certainly for the interest of the landlord to avoid that expence. *Care, however, must be taken, that one farm is not enriched at the expence of the other, by the conveyance of produce, unless a fair proportion of manure is returned.*

should become again advisable ; but where that is properly adverted to, the farm may certainly be brought into a better, rather than into a worse condition. Nor can any serious mischief arise from the practice, for the evils, if any, will correct themselves. If a man rents more land than he can advantageously manage, either by himself or others, he suffers of course, and his business is of necessity contracted to that scale, which his capital, industry, and abilities are adequate to embrace *.

On this subject, it has likewise been ingeniously observed, that every man's profit, in any business whatever, must depend on skill in his profession, and on his diligence. In regard to skill, the greater practice any individual has in a profession, the more experience, and, of consequence, the more skill he will possess. The man of the greatest practice, may not always be the person of the greatest skill, but he certainly ought to possess more, than if his practice had been more limited. It is well known, that this is the case in regard to law and medicine, and it also applies to farming. As to diligence, a great concern is certainly rather a stimulus to it than otherwise. It is generally seen, that the less a man has to do, the less exertion he uses to do that little.

Another argument in favour of extensive occupations is, that a man may be possessed of great capital, and may have acquired great general knowledge in his profession, but cannot attend to the minutiae. This man, if he farms to a great extent, will be enabled to select proper stewards and overseers for each department, and will have every thing conducted in the highest style of farming ; whereas, were such a man limited to a small farm, that will not af-

* Remark by Mr John Shirreff.

ford the expence of an able overseer or steward, from his not being able to attend to the minutiae himself, he would, in all probability, make a very indifferent figure in farming, and his abilities would be lost to himself and to his country.

The expenditure in carrying on the operations on commercial or led-farms, may perhaps be greater, than where every thing is conducted under the eye of the master ; but there are advantages which more than counterbalance that objection; so that, on the whole, the profit on these farms, ought to be fully as great, as on residing farms : neither will the population decrease, and, indeed, it will in general be the reverse ; for the stewards or overseers on these farms, will always exert themselves, for their own credit, to have a command of hands, that all their master's orders may be promptly executed, and that all the operations of the farm may be well finished, and in proper season.

In regard to such farms, it may likewise be observed, that the best mode of occupation, is not that which suits best a few individuals, but the great object is, in all cases, to obtain the greatest produce from the soil, after defraying the expence of seed and labour. This disposable produce will then find its way to all those who are willing and able to pay for it.

As to the idea, that if farms in general were of a large size, it might frequently be difficult to get men of capital to take them, and that it would establish a kind of monopoly ;—it is to be observed, that where leases are granted, persons quit other lines of life, as the army, the navy, the law, commerce and manufactures, and become farmers, thinking it a liberal, creditable, and profitable profession. Hence, in prosperous districts, there can be no want of candidates ; and where there is any de-

ficiency of capital, the payment of the rent may be postponed, till the sale of the crop can produce it, and the buildings and other substantial improvements may be made by the landlord. On such a system, large farms may be introduced, even into poor countries, and persons possessed of even a moderate capital may be enabled to take them. As to the objection, that large farmers are apt to get above their profession, and to become, like gentlemen farmers, luxurious in their mode of living, careless about their business, and trusting every thing to their stewards ; that may happen in particular cases, but can never become general. The exaction of a fair rent, and the pressure of taxes, is a sufficient stimulus to *economy*, as well as to industry and exertion.

It must not be imagined, however, that no arguments can be made use of in favour of small farms, though those in favour of large ones seem greatly to preponderate. There are, it is said, numbers of people, tolerably well skilled in improved agriculture, who have no capital for what is now considered to be even a moderate farm. The share which these farmers, and their families, take in the cultivation of the farm, saves considerable outgoings in the wages and maintenance of servants *, and superior care may be expected; where the whole family are personally interested in the success of the undertaking. It is admitted, that the greater tenants, either as breeders or graziers, will in general produce proportionably the greatest quantity of animal food ; but there are two exceptions even to that rule, in the cases of pigs and poultry, which thrive better, and are more profitable, under the minute attention of the cottager or small farmer.

It is also remarked by Mr Stewart of Hillside, in Dum-

* This advantage is ideal. See note, p. 117.

fries-shire, from whose return the preceding observation is taken, that when a young man sets out in the world as a ploughman, without patrimony, or any thing but what is to be acquired by his own exertions, he may possess, not only worth and industry, but also invention and genius, fit to show an example to all around him, had he an opportunity to do so. But if farms are all large, or even of moderate sizes, such deserving people may never get above the servile state in which they set out in the world *. Many now in the highest class of agriculturists, as well as of store-farmers, exemplary and beneficial improvers of their country, must still have remained in the employment of herding, or at the stilts of the plough, were it not for the progressive size of farms, which enabled them to commence their career in agriculture.

There was a time, says Mr Robertson of Muirton, not yet long past, when the little tenant was unfit for his profession, from want of knowledge. That is rarely the case in these days. Agriculture is now understood by the little tenant of 40 acres, as well as by the great farmer of 400 †.

* It is found, in well-cultivated districts, that persons of this description, who have industry and talents, become stewards or barn-men to large farmers, then overseers to gentlemen, and, latterly, get farms themselves; and thus a spirit of industry and ambition is fostered in that class of men. Besides, it is not the business of the political economist to find situations for the display of individual worth, industry, invention, and genius: these, when left at liberty, will always find a field for themselves. The political economist can only point out such arrangements as are the most likely to promote the general benefit of the community.

† On this subject Mr Shirreff very justly remarks, that though the tenant of 40 acres may naturally be as able as the tenant of 400 acres, he has not had an opportunity of gaining the same quantum of knowledge, by a sufficient latitude of experience. A medical man gets more knowledge by walking the hospitals of a great city in a few months, than an-

The threshing-mill, indeed, is not adapted to the lesser class of husbandmen; but it would be better, it is said, to reduce the power of that complicated machine, to the ratio of the little tenants, than to raise all tenants to the present level of that useful instrument. On the other hand, it is contended, that, a threshing-mill can never be employed with profit, if it is built on a *very small scale*, as it does its work indifferently, and as the hands employed in working it will be almost half idle, though there is reason to believe, that, by some recent improvements at Langholm, threshing-mills on a moderate scale, by which the small farmer may be accommodated with that useful instrument, at so small an expence at from L.10 to L.15, have been invented *.

It is known, however, by experience, that it is impossible that any country can be improved, where small farms prevail, from the difficulty of finding servants and labourers to carry on the necessary improvements. No sooner does any one save a little money as a farm-servant, than he resolves, instead of working for others, to take a farm for himself; and the consequences are, not only a want of labourers, but a race of very indifferent servants, above servitude, expecting soon to be masters. This mischief was fully experienced, when improvements began in a re-

ther from country practice for many years. Many serious blunders may be committed by persons of limited experience and education, particularly in the choice of feeding, and, above all, breeding stock; also in the choice of corn, clover, turnip, seed, &c. which would produce consequences fatal to his prosperity, if he farmed on an extensive scale. It is remarked, however, that if the small farmer has been an overseer on a large farm, he may thus have acquired a sufficient latitude of experience.

* See an account, and an engraving of this machine, in the Appendix, No. XXXIV. p. 120.

most district of the kingdom, (the county of Caithness), and thence it became necessary, to bring as many labourers as could be procured, from those districts where large farms had been introduced, and, consequently, where numbers of people were compelled to look out for work, and to become industrious. The greater number of industrious labourers in England, is in a great measure owing to large farms having been earlier introduced into that country, than was generally the case in Scotland; in consequence of which, a greater number of individuals were compelled to depend on their daily labour for their subsistence, and were accustomed to habits of industry.

Besides, when the inhabitants of any district, into which improvements have been introduced, are removed, which, to a certain extent, must be the case, until a proper system is established, they are not lost to the community, for, unless induced to emigrate to foreign parts, they settle in the neighbouring towns and villages, and become useful and industrious members of society. Many towns in the western parts of Scotland were peopled by the introduction of sheep-farms into Argyleshire, which are not so favourable to population as farms under an improved arable culture; but so far from lamenting that circumstance, these emigrants look down with pity on their former miserable state, and are enabled, from their successful industry, to remit sums of money to their relations, who continue to reside in poverty, in the vales of their ancestors *.

* On the subject of the public advantages derived from the introduction of the system of sheep-farming into the Highlands, the evidence to be met with in the Statistical Account of Scotland, seems to be conclusive. Mr Dugal M'Dougal, minister of Loch-Goil-head, in Argyleshire, (Statistical Account, vol. iii. p. 182), after stating that the great decrease in the population of that parish was owing to the introduction of sheep, proceeds to

On the whole, it appears, that in an extensive tract of country, there must be, owing to a variety of circumstances, a considerable diversity in the size of farms, but at the same time, that there is, in some degree, a regular progress, in regard to their general extent.

At first, when the art of agriculture is in its infancy, farms must be small, because there is neither capital to

observe, 1. That the produce of the district, since sheep became the principal commodity, is at least double the intrinsic value that it was formerly, so that half the number of heads, produce more than double the quantity of provisions, for the support of our large towns, and the supply of our tradesmen and manufacturers; and, 2. That the greater part of those who were dispossessed of their farms, betook themselves to a seafaring life, or settled in the populous towns upon the Clyde; and thus were taken from a situation where they contributed nothing to the wealth, and very little to the support or defence of the state, to situations in which their labour is of the greatest possible utility, where they have an easy opportunity also of training up their children to be useful and valuable members of society.

The following statement is extracted from the statistical account of the parish of Dunoon, in Ayrshire, (Statistical Account, vol. ii. p. 391).—The number of farmers, by the introduction of sheep, and other causes, have certainly decreased, but many of the sub-tenants, with a cow's grass, &c. find themselves easier and better off, than when they occupied a larger possession; and even those who have been obliged to emigrate, have in general settled in Greenock, where they seem better fed and clothed than when they resided in their original parish.

In the statistical account of Inverchoalan, (vol. v. p. 472.), it is observed, that the former possessors, who neither understood grazing nor tillage, and could hardly, by their poor unskilful efforts, gain a miserable subsistence for themselves and their families; happily for them, were mostly removed to the neighbouring towns, where they found sufficient employment, and where many of their children, by the advantages of education, (which they could not enjoy in their own country), have raised themselves to independence, become useful members to the community, and a support and comfort to their parents in their old age.

cultivate, nor skill to manage larger occupations. Besides, a chieftain likes to increase the number of his followers; and, for want of other sources of employment, a father had no other means of providing for his sons, when they remained at home, but by giving them a share of his farm; so that, in the course of a very few generations, a farm of even a considerable extent, was thus frittered down into very trifling possessions. There is a strong tendency, therefore, in the first stages of agriculture, to a reduction of size, and the establishment of what has been called the village system *.

In process of time, however, as capital increases, and skill improves, farms are enlarged; and it is found by experience, that one man can cultivate any given extent of country, (say 300 or 500 acres), at less expence,—can raise a greater produce,—and can afford a higher rent, than a number of smaller occupiers. During this stage of the progress, farms are conjoined, and the farmer of skill and capital, not only takes tracts of country in his own immediate neighbourhood, but, from the cheapness of land, is tempted to speculate in even remote occupations. Farms become then of an enormous extent, and indeed attain a size, which appears calculated, (unless where it is the practice to have married servants), materially to diminish the number of persons employed in husbandry, or deriving their subsistence from the cultivation of the soil.

Two circumstances, however, afterwards take place, which have a strong tendency again to diminish the size of farms.

I. The great inducement of any individual to augment, to any great extent, his concerns in agriculture, is owing

* See Farmer's Magazine, No. LIV. (May 1813), p. 195.

to the cheapness of land, and the greater profits he derives from that circumstance, when united to superior skill and capital; but when, by competition, *the rent of land increases*, and, in regard to skill and capital, many competitors appear, he has then no inducement to continue in the occupation of more than he can conveniently and profitably manage: He diminishes, therefore, the extent of his concerns, by giving up some of his farms to the proprietors, or establishing branches of his family on them.

2. In the vicinity of towns, in which a variety of articles are required from the farmer, he has so many profitable minutiae to attend to, that a large farm becomes unsuitable. In such situations, farms necessarily become smaller; and, indeed, as the rent of land increases rapidly, a great extent of it would prove a most hazardous speculation.

The size of farms must thus depend on the circumstances of a country: What is a proper size in one district, is not so in another; and what is a proper size at one time, is not so in another, even in the same district. At the same time, the extent of such occupations, is the most likely to be advantageously arranged, when the subject is thoroughly understood, and when the principles on which that extent ought to depend, have been ascertained by minute enquiry, and accurate deduction, instead of resting on the personal experience and observation of each individual, who may have a farm, either to let or to occupy.

DISSERTATION II.

ON LEASES; AND THE MEANS BY WHICH A LIBERAL SYSTEM
OF CONNECTION BETWEEN THE LANDLORD AND TENANT CAN
BEST BE ESTABLISHED.

THE nature of the connection between the landlord and the tenant, in countries where the feudal system was established, has greatly altered, with the progress of political society. In ancient times, it was of a military description. The proprietor of an estate was himself a warrior, and those who possessed land under him, were his soldiers, who were bound to military service, and who paid him hardly any rent, with the exception of some articles in kind, for the maintenance of his family.

When the feudal system was abolished, the landlord, at first, still considered himself as the patron of those who were placed under him. The rents continued low; the occupiers of the estate claimed, from generation to generation, under the name of "*Kindly Tenants*," a sort of tacit patrimonial interest in their respectable possessions*; and

* See Aiton's Survey of Ayrshire, p. 176.

paying very inadequate rents, and having no permanent security in their possessions, nothing could exceed their indolence, their ignorance, and of course the poverty of their condition.

The connection between the two classes is now of a description totally different. The landlord considers himself as the owner of an estate, of which he must make the most he can, for the benefit of himself and family; he lets it for a certain number of years, to persons possessed of skill, integrity, industry, and capital, under the obligation of paying him a specific sum *per annum*, out of the annual produce, besides being bound, if not to improve the value of the property, at least that it shall not be deteriorated during the currency of the lease. The contract becomes more of a mercenary nature, without however totally destroying ties of a more pleasing description; for the landlord, on the one hand, must still feel himself deeply interested in the success of his tenant, on which his own income and prosperity materially depend; whilst the tenant, on the other, looks up to his landlord as a friend, whose interests are necessarily incorporated with his own, and who will naturally be inclined to give an industrious and improving tenant a preference, when the farm is to be re-let.

Under this new system it is essential, both for the landlord and the tenant, to take various particulars into their consideration, in order that the connection between them may be established on just and liberal principles. That connection is one of the most satisfactory, as well as the most important, that exists in political society. It does not depend upon the mere covenants of a lease, but upon a conviction, that the interests of the two parties are interwoven together, and that it is necessary for both parties to take into consideration the following circumstances, as the basis

of their future connexion : 1. The extent of capital which the farmer may require to enable him to commence and to carry on his operations ; 2. The expence and profit of farming ; 3. The proportion of the annual produce to which the landlord is entitled, under the name of rent ; and, 4. The duration of leases, and the covenants which they ought to contain.

SECT. I.—*On the Capital necessary to enable a Farmer to commence and to carry on his Operations.*

A proprietor ought to ascertain, when an individual offers to take his farm, not only the character of the person who offers, in regard to professional knowledge and ability, to industry, and to integrity, but also whether he is possessed of a capital adequate to its due cultivation. No prudent landlord will ever think of giving the possession of any part of his estate to a needy adventurer, who may bid a high rent, without the means of fulfilling his engagement *. It is incumbent upon the tenant also to calculate, what capital the farm he offers for will require, and whether he can command that capital. The tenant,

* It is contended, that the best tenant, and the best mode of occupation, may in general be decided by the amount of the proprietor's rent-roll. Yet the highest offer ought not always to be preferred ; for a merchant would act very unwisely, who should dispose of his commodities to a person who should offer such a price, as it might be justly suspected he could never afford to pay, even though the buyer's circumstances, at the time, were not doubted.

depend upon the period when the rent becomes payable. If the farmer enters in May *, and pays one half year's rent in November, and the other half in the May following, (which in Scotland is called a fore-hand rent), it is certainly a hardship that he should be liable for rent, before he has had any return from the land, out of the actual produce of which it ought to be paid. 8. In the last place, a tenant, on entering on a farm in May, has to maintain himself, his family, and his servants, for eighteen months, before he can draw any profit from the land, excepting from the cattle kept during the winter, which he may perhaps sell in the spring, or the summer following. No rent, therefore, should be paid on an arable farm, where the farmer obtains possession of only the houses and grass in May, and has not a corn crop till the year which succeeds his entry, or until at least a year and a half after that entry. He has not the means of paying any rent at an earlier period, unless it is taken from his capital, which would tend to cripple his future exertions. It is a better plan, therefore, both for the landlord and the tenant, that the entry should always be at Martinmas, and that the payment should commence at the Candlemas in the second year, or 15 months after the period of entry. The fixing of a judicious term for the entry into farms, is a subject of more importance than is commonly imagined.

Regarding the capital required by an arable farmer, returns have been transmitted to me by a number of intelligent farmers, and after forming a calculation of the sizes of the different farms, and the sums required for each, the result was, that L.8, 9s. per Scotch, or L.6 : 12 : 9 per

* The entry ought always to be at Martinmas, (the 11th of November), both to houses and land.

English acre, was, *on an average*, supposed to be sufficient *, and that where a larger sum is laid out, the farmer must have in view some advantages to counterbalance the additional expence. Even in Berwickshire, the sum required, under proper management, does not much exceed the above estimate. A farmer in that country, took, on lease, a farm of 600 acres of turnip soil. It had been rented at only 10s. *per English acre*, and he agreed to give 31s. 6d. Much was to do in regard to manuring, liming, draining, purchasing stock, &c. ; but at the end of the four first years, upon balancing his books, the farm owed him only L.4400, or about L.7, 7s. *per English acre*, making a fair allowance for the annual maintenance of the farmer and his family.

It must be admitted, that any estimate of the sum required to stock a farm, must be fluctuating, depending upon the prices, at the time, of the various articles which the farmer requires. As it is desirable, however, to have some idea of the articles necessary, and of the total amount, the following estimate, drawn up by an experienced and intelligent farmer, (Mr Dudgeon of Prora, in East-Lothian), is submitted to the reader's consideration, as applicable to a district in a high state of cultivation, and where the farmers are opulent.

* In England, it is considered to be an established fact, that arable land worth 30s. *per acre*, requires L.10 of capital *per acre*. But, where attention is paid to economy, a less sum will suffice, as, according to the Scotch system, fewer horses are required, and the instruments of husbandry are simpler and cheaper than those in England. It is remarked, on the other hand, that the superior economy of the Scotch system, is counterbalanced by the improvements, which the leases, so universal in Scotland, justify, and even encourage, and upon the faith of which the rent is offered.

Estimate of the Sum required to stock a Farm of 300 Scotch, or 380 English Acres of Clay Land.

12 Plough-horses, at L.50.....	L.600	0	0
1 Supernumerary.....	30	0	0
1 Saddle-horse.....	50	0	0
Furniture for the whole.....	66	0	0
6 Ploughs, at L.4.....	24	0	0
12 Harrows, at L.1, 7.....	16	4	0
2 Rollers, 1 stone, the other of wood, covered with plate-iron, and a box to hold as much weight as make them equal.....	10	16	0
6 Close carts, at L.15.....	90	0	0
6 Long ditto, at L.4, 4.....	25	0	0
2 Wheel-barrows, at L.1, 1.....	2	2	0
2 Hand ditto, at 5s.....	0	10	0
Forks, graipe, &c.....	3	3	0
72 Corn bags, at 4s.....	14	8	0
2 Firlets, at L.1.....	2	0	0
Barn looms, rakes, &c.....	3	10	0
Threshing-machine, with appendages.....	200	0	0
2 Set of hand-fanners, at L.5.....	10	0	0
Smith, for supporting ploughs and carts.....	21	0	0
Wright, for ditto.....	15	0	0
One-half statute road-money, at 40s. per plough.....	6	0	0

L.1189 15 0

Six Servants for 1st Year.

72 Bushels oats, at 25s.....	L.90	0	0
18 —— barley, at 30s.....	27	0	0
12 —— peas, at 25s.....	15	0	0
½ —— wheat, at 40s. per stacker.....	1	0	0
One pair of shoes to sower.....	0	10	0

— 133 10 0

Horses.

240 Bushels oats, at 24s.....	L.288	0	0
7 Acres grass, at L.8.....	56	0	0
3 —— tares, at L.7.....	21	0	0
1200 Stones of hay, at 10d.....	50	0	0

— 415 0 0

Carried forward, L.1738 5 0

Brought forward,.....L.1738 5 0

Seed Corn.

Acres. Bolts.

Fallow,.....50.....0.....	L. 0 0 0
Wheat,.....50.....37½ at 40s.....	75 0 0
Clover,.....50.....50.....	50 0 0
Oats,.....50.....50 at 25s.....	62 10 0
Beans,.....50.....62½ at 25s.....	78 2 6
Wheat,.....50.....50 at 40s.....	100 0 0
	————— 365 12 6
300	—————

L.2103 17 6

Lime for one sixth part of the farm, 50 acres,.....L.500	0 0 0
3 Extra servants, at 12s. a-week, for 9 months,...	64 16 0
400 Cubic yards dung, at 3s. the price to the in- coming tenant, (viz. half price).....	60 0 0
Filling and spreading the same, making 600 cart- loads, at 3d.	7 10 0
Shearing and leading first crop on 200 acres, at 28s. 6d. per acre,.....	285 0 0
25 Cattle for wintering in the straw-yard, at L.10 each,.....	250 0 0
4 Milch cows, at L.16,.....	64 0 0
Interest on prompt outlay on first entering on the farm, at 5 per cent. for 5 months, for L.900,....	18 15 0
	————— 1250 1 0

Total,.....L.3383 18 6

Which is at the rate of L.11 : 3 : 7 per Scotch, and L.8 : 18 : 1 0½ per Eng-
lish acre.

In this calculation no allowance is made for the first year's rent, nor for furniture, nor the maintenance of the family, which would add considerably to the preceding estimate; but the amount of which must depend on a great variety of circumstances.

It is evident that there must be a great diversity of opinion regarding the various articles above enumerated. Some recommend having 14 instead of 12 horses, and

giving a higher price for them than L.50 *per pair**. Others insist on more economy in the first expenditure : they say, that a prudent farmer, if he has not a large capital at his command, will purchase eight horses, past their prime, which he may buy for L.25 each, together with four breeding mares, and in five or six years he would be fully supplied with good stock, and may sell his old horses without much loss. In many cases such shifts must be resorted to, where there is any deficiency of capital.

Some object to the idea of having only two rollers, considering four as necessary on a large farm, two of stone and two of wood, as two must frequently work together, and one of stone and one of wood would not suit. This would increase the expence of rollers from L.10, 10s. to L.20.

Others contend, that it is necessary to have 1200 cubic yards of dung for such a farm, to dung the fallow wheat, and the oat stubble for the beans ; but to that it is answered, that no such quantity can ever be obtained from an outgoing tenant, and it is only what can be bought in such a situation, that can be included in the expence of stocking a farm.

It is also said, that the quantity of oats given to the horses is more than is necessary, and the quantity of hay and grass too little ; and that many farmers in the Carse of Gowrie feed their horses entirely on clover throughout the whole summer ; but, if they are well worked, particularly in driving lime, substantial feeding is necessary.

* In regard to the price of horses, that is perpetually fluctuating. More than even fourteen horses would be required, were no carts hired to drive lime ; but in the estimated price of that article, the expence of carriage is included for a tolerable distance from lime.

It is also observed, that the rotation proposed, makes the return of crops of wheat too frequent; and hence it arises, that the grain is so often blighted, or the quality inferior; by such severe cropping, it is said, that the condition of the ground is so reduced, as to render it unfit for producing good grain.

It would be tedious to insert, in this work, all the various calculations which have been transmitted to me, of the capital necessary to stock an arable farm; but I shall endeavour shortly to state some of the most interesting observations, which I have received upon the subject.

In the county of Moray, it is stated, that where the tenant has to build houses, and inclose the farm at his own expence, it would require L.3000 to stock 220 Scotch acres, that is at the rate of nearly L.13, 13s. per Scotch, or L.10 : 18 : 6 per English acre; but it is observed, at the same time, that half that sum would be sufficient, if the proprietors were to build the houses, inclose the farm, and allow a sufficiency of lime. For these expences they would be amply repaid, as tenants of small capital would then embark in farming, and more candidates would present themselves, which would tend to the increase of rent. Besides, the capital of the farmer, if laid out in buildings, is locked up in permanent works, yielding him no annual return, and in which he has only a temporary interest; whereas, it would be more beneficial for both parties, that the farmer's capital were to remain at his command, for improvements that would yield him some yearly profit, or which might meet the failure of crops, and other casualties to which he is exposed.

The Reverend Dr Skene Keith has given, in his valuable Report of Aberdeenshire, a detailed account of the first expence on entering to a farm in that county, at Whitsunday 1806, upon a new lease for 19 years, with the

subsequent charges incurred till Martinmas 1807, when the tenant had harvested the first crop, 18 months after his entry. Its extent is 190 Scotch, or 239 English acres. His rent is L.170 in money, 20 bolls of oat-meal, (equal to 10 sacks of 280 avoirdupois), and four bolls of bear or bigg, above three Winchester quarters.

Expences at his Entry.

Household furniture, and implements of husbandry brought with him.....	L.234 5 0
Paid to the heirs of the former tenant,	
For melioration of his farm-house and offices.....	380 0 0
For the machinery of a threshing-mill.....	45 0 0
For hay and pasture grass, to prevent breaking up the land.....	270 0 0
For old corn and straw of crop 1805.....	33 0 0
For the rent of two acres of bear sown after turnips.....	14 0 0
For seed to ditto.....	2 0 0
For grass-seeds sown among his corns, and putting them in.....	13 4 0

His expences at entry were in all L.991 9 0

His six horses were worth.....	150 0 0
— six cows and two calves.....	50 0 0
— twelve oxen.....	180 0 0
— twenty-two other young cattle.....	184 0 0
He paid for road assessments and other taxes.....	4 0 0

His expences and stocking united were L.1569 9 0

For the first Six Months after his Entry.

His servants wages, exclusive of their board wages.....	L.35 0 0
— family-expences, and board-wages of servants.....	78 0 0
— fuel cost.....	9 0 0
For corn and fodder, i. e. corn with the straw.....	154 0 0
For lime got in the last six months.....	44 0 0

His expenditure at Martinmas 1806, L.1879 9 0

Carried forward, L.1879 9 0

	Brought forward,.....L.	1879	9	0
I n the course of next year, before he had a crop of his own, he paid,				
F or fuel, meal, and malt to his family,.....	59	18	0	
F or wheat-seed to a small patch of land,.....	1	1	0	
F or turnip-seed in eighteen months,.....	..1	4	0	
F or an additional horse bought,.....	27	0	0	
W ages for one year to six men and three women servants,.....	94	0	0	
T o harvest shearers and day labourers,.....	21	0	0	
F arming implements, and blacksmith's and carpenter's accounts since his entry,.....	71	10	0	
L ime in 1807,.....	121	0	0	
I ncidents and travelling expences to his servants,.....	15	15	0	
	Total expences and value of stock,.....L.	2291	17	0

When the interest of capital and the farmer's personal expences are added to the above, the total sum will amount to about L.2500, or L.13 : 3 : 2 per Scotch, or L.10 : 10 : 6½, per English acre, partly owing, however, to his having entered at May, instead of November.

It is not a common practice in Scotland, for the incoming tenant to pay the outgoing one, for meliorations upon the farm-house and offices, nor does it often happen, that so large a sum, as noticed in the above estimate, is paid to prevent the breaking up of pasture-grass. But, on the other hand, it is very common, in all the arable districts of the kingdom, for the incoming tenant to receive a certain portion of the farm for turnips or summer-fallow, for which he generally pays the outgoing tenant, according to what it might have been worth to him for his last crop, which, with what is often paid for cutting grass for work horses, and for any dung that may be upon the premises at the term of entry, always amounts to a considerable sum. The other items of expence, are

somewhat similar, to what every incoming tenant, in all the lowland districts of the country, generally has to pay.

In the Carse of Gowrie, where the farmers in general enter at Whitsunday, and then get possession of the houses only, it is calculated, that it will require L.10 *per Scotch*, or L.8 *per English acre*, of capital, exclusive of rent, of payments for fallow done, or the manure to be purchased. Besides, the family and servants must be maintained for eighteen months, and the stock for about twelve months, before the farm produces any thing to the new-coming farmer. This however is greatly owing to the injudicious term at which he enters.

In Fife, it is observed, that on all soils, poor or rich, the least sum that is necessary is two years and a half rent of the farm, free of debt. Three or four years rent is still better; and five years rent can be profitably employed in stocking a farm, but more is not required, unless great and expensive improvements are to be executed.

In the county of Clackmannan, about L.1600 is required to stock a farm of 180 Scotch acres. This is at the rate of nearly L.8, 18s. *per Scotch*, or L.7 : 2 : 5 *per English acre*.

In Stirlingshire, it is observed, that the sum required for stocking a farm, must vary according to circumstances, and the condition of the farm; in general, however, upon entering on a new lease, a farmer requires to be possessed of from L.8 to L.10 of capital, for every Scotch acre he means to occupy. This is at the rate of from L.6, 8s. to L.8 *per English acre*.

An intelligent farmer in Mid Lothian informs me, that in the year 1754, he stocked a farm of 110 Scotch, or 132 English acres, which in those days required ten horses, for two four-horse ploughs, and for one two-horse cart employed in collecting manure, &c. He kept a minute

account of the whole expenditure, which amounted to a trifle more than L.400. This is at the rate of L.3 : 12 : 8 per Scotch, and L.2 : 18 : 2 per English acre. It would now require above triple the amount to stock the same farm; notwithstanding, that the number of horses is so much diminished by the introduction of two-horse, according to the improved system of modern husbandry, instead of four-horse ploughs.

Without going through the various other communications which I have received upon the subject, I shall content myself with adding an estimate, drawn up by a farmer in Roxburghshire, of the sum it actually required to stock an arable farm of 200 English acres, which he entered to at Whitsunday 1810.

To one year's rent, at L.1, 18s. per acre.....	L.350	0	0
To four work-horses, at L.35 each.....	140	0	0
To keeping four horses for one year.....	110	0	0
To two carts, at L.15 each.....	30	0	0
To two ploughs, at L.3 each.....	6	0	0
Two pair of hargows.....	3	0	0
To harness for horses.....	15	0	0
To twenty Highland cattle, at L.5 each.....	100	0	0
To two hinds, for one year, at L.35 each.....	70	0	0
To a boy.....	8	0	0
To grass seeds, for sowing down 40 acres.....	24	0	0
To seed wheat, for 20 acres, 10 bolls, at L.3, 10s. per boll.....	35	0	0
To seed barley, for 24 acres, 12 bolls, at L.2, 5s. per boll.....	27	0	0
To seed oats, for 40 acres, 28 bolls, as L.1, 15s. per boll.....	49	0	0
<hr/>			
	L.967	0	0
Deduct from this 40 acres of grass, at L.1, 15s. per acre.....	70	0	0
<hr/>			
	L.897	0	0
Add for maintaining farmer's family, taxes, &c.....	280	0	0
<hr/>			
	L.1127	0	0

The above is the sum which it will in general cost, to stock a farm of that extent, with some variation according to circumstances. It is at the rate of

L.5 : 12 : 8 *per English acre.* It is contended, however, that the deduction of the 40 acres of grass ought not to have been made, as the grass is a part of the first year's crop.

Industrious tenants, therefore, even with moderate capitals, ought not to be discouraged by any idea, that an overgrown capital is necessary for taking a farm. They certainly ought not to trust to the chapter of accidents, nor undertake more than their capital and credit will enable them to go through; but where the rents are moderate, and the landlord is disposed to give them every reasonable encouragement, from L.6 to L.10 *per Scotch acre*, according to circumstances, may suffice.

As a considerable capital, however, is necessary, it is well worth consideration, whether some means ought not to be devised, that will enable the farmer to procure the use of capital, on as easy terms as the manufacturer or the merchant. He ought to gain 15 *per cent.* on the capital he lays out. He can easily therefore pay 5 *per cent.* for the money he may have occasion to borrow. Let him then be furnished with the means of giving adequate security; let the tenant have the power of sub-letting his farm, or assigning his lease, giving, on equal terms, the preference to the landlord, after the farm is improved. A prudent farmer, of respectable character, would in that case never want credit when necessary, and all difficulties regarding the capital required, would in a great measure be done away. This important subject will afterwards be resumed, at the conclusion of this Dissertation.

SECT. II.—*On the Expence and Profit of Farming.*

THIS is a subject of great importance on various accounts. It is necessary to check, as much as possible, by authentic statements of the expence and profit of farming, a spirit of speculation and rivalship, which has a tendency to raise the rent of lands too high; a circumstance which would prove equally injurious to the tenant and to the landlord *. The rent should only be carried to such a height, as may be sufficient to enforce industry and improvement, and to promote economy in management, without discouraging exertion; and wherever there is the least doubt, in regard to probable produce, markets, &c. the cast or balance should always be in favour of the tenant.

In offering for a farm, the tenant should take into serious consideration the innumerable risks to which he is subjected, from defects in the soil, inclemency of the seasons †, improvident laws, want of sale for the articles he

* It is contended, that the temporary occupation of the soil, is as fit a subject of competition as any article of commerce; and that every landlord is not only entitled to make the most of his property, but that the improvement of the country, and the best interests of the community, require that he should. This principle, however, must not be carried too far.

† Whilst writing this sentence, I received a letter from Muirton, in Kincardineshire, dated 20th November, in which there is the following paragraph:

“The rain is pouring on in tubfuls, and nearly all the beans still in

raises, mercantile failures, want of health to attend to his business, deficiencies of crops, and various other contingencies.

In accepting an offer for a farm, the landlord ought to consider the character of the person who offers, the capital he is possessed of, his skill in farming, the probable produce under medium management, and the average amount and value of that produce, on a medium of years; so that after paying the rent, and all expences, the tenant may have a fair share of the produce, a handsome interest for the capital employed, and an ample competence to enable him to live comfortably, to maintain and educate his family, and to lay up a surplus for contingencies. The rent of the farm, however, should always be such as to promote exertion and improvement*.

"the field; also much oats and bear. It has rained incessantly for four weeks."—A miserable prospect to a farmer, if he is liable to a very high rent!

* On the subject of rent, Mr Aiton, in his Survey of Ayrshire, p. 176, &c. has pointed out the injurious consequences resulting from rents when too low. He observes, that formerly the tenants claimed, from generation to generation, a sort of tacit patrimonial interest in their respective possessions, known in Ayrshire by the right of "*Kindly Tenants*." The rejection of their claims, which excited loud and reiterated complaints among the tenantry, has been notwithstanding productive of much good, not only to the proprietors, but even to the tenantry, as well as to the public. While the former tenants and their heirs were continued in their possession, and the rents not much raised, their indolence and bad habits were also continued; but by laying the farms open to public competition, the proprietors have had a choice of tenants; the most active and industrious were preferred, which operated as an incitement to others to become more industrious; and every advance in the rent, called forth a greater stretch of invention, and served as a *stimulus* to industry.

The rent of any farm may be stretched to a pitch which no industry

There is another point of view in which a discussion on the expence and profit of farming is of the utmost importance, as it is necessary to ascertain to what extent arable cultivation ought to be extended. Land that will not produce 30 bushels of oats, 24 bushels of barley, and 18 bushels of wheat, *per* statute acre, under the best management that circumstances will admit of, had better remain in pasture.

With a view of communicating data, on which calculations may be made of the expence and profit of farming on a large scale, I shall subjoin estimates, with which I have been furnished by two respectable practical farmers. It is evident, at the same time, that these calculations are only applicable to improved districts, where the soil is fertile, the farms are of a proper size, and where the tenant enjoys these most important advantages, a favourable climate, a fertile soil, good roads, and vicinity to market.

can reach ; but if not carried too far, the raising of rents will do more to excite industry, than ever so many lectures upon the subject. A fair increase of rent, where that has not hitherto taken place, it is contended, would be productive of the following advantages :—1. There would be more economy in the management of farms.—2. There would be more industry and exertion to raise a greater produce, and to bring it to a better market.—3. There would be a disposition to try experiments for the purpose of acquiring more knowledge in farming ; and farmers would go about to acquire knowledge, instead of remaining sluggishly at home.—4. The proprietors, receiving a better income, would be enabled to live more comfortably, and to do more good.—5. The revenue of the country would be greatly increased, more especially while the property-tax continues on its present footing.—6. Fair rents are a *stimulus* to improvement. At the same time, the hopes of ultimate independence will always be a better, and more generally operating *stimulus*, with all good farmers, than the fear of the landlord.

1. Statement by Mr Murray, lately residing at Kirkland-hill, in East-Lothian.

Mr Murray supposes a farm to consist of 400 Scotch acres of good hard clay soil, divided into eight fields; six of the fields under a rotation of six courses, and two of them old pasture; when these are taken up, two to be laid down for pasture.

<i>Nos.</i>	<i>Acres.</i>	
1.	say 50 of fallow to have 4 or 5 furrows and harrowed, &c.	
2.....	50 of wheat, at 10 bolls, 500 bolls at 40s. per boll, L.1000	0 0
3.....	50 of clover, at.....200 stone per acre, L.10.....500	0 0
4.....	50 of oats, at 10 bolls,....500 bolls, at 25s. per boll,.....625	0 0
5.....	50 of beans, at 8 bolls,....400 bolls, at 25s. per boll,.....500	0 0
6.....	50 of wheat, at 10 bolls, 500 bolls, at 40s. per boll,.....1000	0 0
7, 8.....	100 in 2 fields for pasture,..... at L.8, 10s. per acre, 350	0 0
<hr/>		
400 to produce	1900 bolls, and 100 acres } pastured.....	L.3975 0 0

As land lets at present, this farm should rent at L.1600 per annum, or L.4 per Scotch acre. The produce is at the rate of L.9 : 18 : 9 per Scotch, and L.7, 19s. per English acre.

The following is an abstract of the expence of cultivating such a farm.

Abstract of the Work of Men and Horses.

Nos.	Acres.	Days.	
1. Fallow.....	50..325	of a man and two horses,.....	L.162 10 0
2. Wheat.....	50..171 $\frac{1}{4}$	ditto,.....	85 15 0
3. Clover.....	50..125.....	ditto,.....	62 10 0
4. Oats	40..169.....	ditto,.....	84 10 0
5. Beans.....	50.. 285.....	ditto,.....	142 10 0
6. Wheat.....	50..171 $\frac{1}{4}$	ditto,.....	85 15 0
7, 8. Pasture..	100.....4.....	ditto,.....	2 0 0
<hr/>			
Acres 400...1251 days.....			L.625 10 0

Six two-horse ploughs might do the work upon the farm, though many would prefer seven.

Abstract of Labourers on each Field.

<i>No.</i>	<i>Acres.</i>	
1.	Fallow 50	100 days spreading dung, at 2s. 6d.....L.12 10 0
2.	Wheat 50	328 days work.....72 14 0
3.	Clover 50	per account.....56 18 0
4.	Oats 50	328 days.....72 14 0
5.	Beans 50	per account.....78 5 0
6.	Wheat 50	328 days.....72 14 0
7.	8. Pasture 100	the expence of a herd.....30 0 0
	Acres 400	L.1021 0 0

General Statement.

1.	Total expence of labour.....	L.1021 0 0
2.	Rent $\frac{4}{5}$ of the produce.....	1600 0 0
		L.2621 0 0
3.	Balance, for seed to add to sow the crop, 100 acres wheat,	
	50 acres oats, 50 acres beans, 50 acres clover.....	
	Labouring utensils upholding.....	
	Manure to the farm, above what the straw produces.....	
	Interest of L.4000 of stock.....	1354 0 0
	Per centage on the perishable stock and lost time.....	
	The necessary maintenance of the farmer's family, taxes,	
	&c.....	
		L.3975 0 0

It may be proper now to give the same estimate in English acres, without inserting fractional parts.

<i>No.</i>	<i>Acres.</i>	
1.	Fallow 63	of fallow, to have 4 furrows and harrowed.
2.	Wheat 63	of wheat, quarters 255, at L.3 : 18 : 3½.....L.1000 0 0
3.	Clover 63	of clover, at L.17 : 17 : 4½.....500 0 0
4.	Oats 63	of oats, quarters 372, at L.1 : 13 : 6½.....625 0 0
5.	Beans 63	of beans, quarters 204, at L.2 : 9 : 11.....500 0 0
6.	Wheat 63	of wheat, quarters 255, at L.3 : 18 : 3½.....1000 0 0
7.	8. Pasture 127	in two fields for pasture, at L.2 : 15 : 0½.....350 0 0
	508	Produce, 1087 quarters. L.3975 0 0

Abstract of the Work of Men and Horses.

<i>Nos.</i>	<i>Acres.</i>	<i>Days.</i>	
1. Fallow...63.....	325	man and two horses,.....	L. 162 10 0
2. Wheat...63.....	171 $\frac{1}{4}$	ditto,.....	85 15 0
3. Clover...63.....	125	ditto,.....	62 10 0
4. Oats.....63.....	169	ditto,.....	84 10 0
5. Beans....63.....	285	ditto,.....	142 10 0
6. Wheat...63.....	171 $\frac{1}{4}$	ditto,.....	85 15 0
7, 8. Pasture 127.....	4	ditto,.....	2 0 0
	508	1251 days.....	L. 625 10 0

Abstract of the Labourers on each Field.

<i>Nos.</i>	<i>Acres.</i>	
1. Fallow...63.....	100 days spreading dung, 2s. 6d....	L. 12 10 0
2. Wheat...63.....	328 days work,.....	72 14 0
3. Clover...63.....	per account,.....	56 18 0
4. Oats.....63.....	328 days,.....	72 14 0
5. Beans....63.....	per account,.....	78 5 0
6. Wheat...63.....	328 days,.....	72 14 0
7, 8. Pasture 127.....	expence of a herd,.....	30 0 0
	508	L. 1021 0 0

General Statement.

1. Total expence of labour,.....	L. 1021 5 0
2. Rent $\frac{4}{500}$ of the produce,.....	1600 0 0
	L.2621 5 0
3. Seed to add to sow the crop, 100 acres wheat, 50 acres oats, 50 acres beans, 50 acres clover,.....	
Labouring utensils upholding,.....	
Manure to the farm above what the straw produces,.....	
Interest of L.4000 of stock,.....	
Per centage on the perishable stock and lost time,..	
Necessary maintenance of family, taxes, &c.....	
	1354 15 0
	L.3975 0 0

*ment of the Produce, Rent, and the Expence of cultivating
an in East-Lothian, of 533 Scotch, or 702 English Acres,
George Rennie, Esq. of Phantassie.*

1. PRODUCE.

ons.	Fallow.	Wheat.	Hay.	Oats.	Beans.	Pasture.	Price.	L.	s.	d.
ay Soil....		Bolls	Stones.	Bolls	Bolls	s.				
fallow....	42	—	—	—	—	—	—	—	—	—
wheat.... at 10 bolls per ac.	420	—	—	—	—	40	840	0	0	0
hay..... 200 stones	—	8400	—	—	—	1	420	0	0	0
oats..... 10 bolls	—	—	420	—	—	25	525	0	0	0
beans..... 8	—	—	—	336	—	24	403	4	0	0
wheat.... * 8	—	336	—	—	—	40	672	0	0	0
		756	8400	420	336	—	L.2860	4	0	0
ight Soil.			Barley.							
turnips....	—	—	—	—	—	10l.	620	0	0	0
barley.... 10 bolls per acre,	—	310	—	—	—	30s.	465	0	0	0
wheat.... 8	—	248	—	—	—	40s.	496	0	0	0
grass pastur.	—	—	—	—	—	62 140s.	434	0	0	0
ats.... 10 bolls per acre,	—	—	—	620	—	25s.	775	0	0	0
ast. old.	—	—	—	—	—	53 90s.	238	10	0	0
rip land and grass.	1004	310	1040	336	—	—	L.5888	14	0	0
land.										
is.	Average produce, per Scotch acre, in six years, L.11, 7s. or per English acre, L.9 : 1 : 7.									

eat after beans, is never so productive as wheat after fallow, by two acre.

It appears from this interesting statement, that winter wheat, sown in spring after turnips, yields within two bolls, per acre of the produce on strong land after summer-fallow; so that, considering the expence of the fallow, and the loss of rent for one year, wheat is raised at a cheaper rate, on this plan, after turnips, than after fallow. It also appears that in East-Lothian, and other favoured climates, it is more profitable to sow winter wheat in spring, than barley; for that grain, at ten bolls per acre, and 30s. per boll, produces only L.15; whereas the wheat, at eight bolls per acre, and 40s. per boll, yields L.16 per acre. The straw of the wheat also is much more valuable, and the succeeding crop of grass (the wheat crop not being so apt to lodge) is better. The advantage, therefore, of raising winter wheat in spring, and after turnips, fed by sheep on the ground, cannot, in the whole, be stated at less than L.3 per acre. It must be admitted, that the land is left in better condition after barley than after wheat, and the difference would probably be made up by the after crops in the course of future rotations; at the same time, if wheat must be raised in greater quantities, to prevent an injurious dependence upon foreign powers for bread-corn, we are thus furnished with the means of raising it *.

* On this subject Mr Rennie however remarks, that when wheat is raised after turnip, it is sown upon the land from which the turnip is first taken off, which is generally the best in the field: barley, on the contrary, is sown upon the 'last eat off', and is frequently much hurt by the growth of the turnips in the spring months. After attentively taking the whole circumstances into consideration, therefore, though there may be some lands on which, from soil, climate, and situation, winter wheat may be sown in spring with advantage, yet, on the whole, he is of opinion that barley is the most advantageous crop of the two. This must particularly be the case, where the seasons are precarious.

2. EXPENSES.

	Wheat.	Barley.	Hay.	Oats.	Beans.	L.	s.	d.	L.	s.	d.
									at 90s.	2488	10 0
I.											
1. Rent of 553 acres Scotch, at 90s....	—	—	—	—	—	—					
2. Wheat for 42 acres, at 3 firlots per acre.....	31½	—	—	—	—	at 40s. 63	0	0			
3. Hay for 42 acres, seeds.....	—	—	—	—	—	—	42	0	0		
4. Oats for 42 acres, at 3 firlots, 2 pecks	—	—	—	42	—	25s. 52	10	0			
5. Beans for 42 acres, at 1 boll, 3 pecks	—	—	—	—	50	24s. 60	0	0			
6. Wheat for 42 acres, at 1 boll.....	42	—	—	—	—	40s. 84	0	0			
									301	10	0
II.											
1. Turnips for seed, at 2lbs. per acre....	—	—	—	—	—	—	6	6	0		
2. Barley for seed, 2 firlots, 1 peck....	—	18	—	—	—	—	30s. 27	0	0		
3. Wheat for seed, 1 boll.....	31	—	—	—	—	—	40s. 62	0	0		
4. Hay for seed.....	—	—	—	—	—	—	62	0	0		
5. Oats for seed, 3 firlots, 2 pecks....	—	—	—	54	—	—	25s. 67	10	0		
Expences	104½	18	—	96	—	—				224	16 0
Horse corn.....	—	—	—	350	—	25s. 437	10	0			
hay.....	—	—	2000	—	—	10d. 83	6	8			
grass, 10 acres...	—	—	—	—	—	160s. 80	0	0			
tares, 5 acres....	—	—	—	—	—	160s. 40	0	0			
									640	16	8
Smith and wright work.....						100	0	0			
Servants, 17 men, at L.36 a-year.....						612	0	0			
3 men and a boy.....						80	0	0			
Turnip work, &c.....						50	0	0			
Harvest work, &c.....						300	0	0			
Taxes and incidents.....						190	0	0			
									1332	0	0
Profit.....									4987	12	8
Total produce.....									901	1	4
									L. 5888	14	0

If the total profit is L.901 : 1 : 4, that is at the rate of L.1 : 12 : 7 per Scotch, and L.1 : 6 : 1 per English acre. From that profit, the family of the tenant is to be maintained, and the interest of the capital employed, which cannot be calculated at less than L.6000, must be paid. The profit on the capital is only at the rate of about 14 per cent. an interest hardly equal to that to which a farmer is justly entitled, considering his toil, and the hazards to which he is liable from the seasons, the markets, &c. On this subject it is well observed, by Mr Dudgeon of Prora, that if something decent is not made by skilful and industrious farmers, it would injure both the proprietors of land and the public. Adventurers of a different stamp would occupy the farms, and the genius and spirit of agriculture would become languid, and perhaps expire.

The preceding estimates shew the great importance of having farms of a proper size. On a farm of 100 or 200 acres, a farmer, who paid a high rent, could hardly exist; whereas, on a farm of 500 acres, even paying a high rent, he may live comfortably, without requiring so much capital as if the farm had been divided into several small ones*, and without much more additional risk or labour, in overseeing the more extensive farm.

In regard to the farm of Phantassie, in particular, the intelligent author of the preceding estimate adds, that this farm ought to be considered as connected with a pretty large distillery, from which abundance of rich dung is procured. There is also a lime-rock on the premises, from which that valuable article is easily obtained,—advantages which are hardly ever to be met with united.

* For instance, having only one house, one set of offices, one threshing-mill, &c.

On the whole, though, in compliance with the request of the President of the Board of Agriculture, Mr Rennie made a return, according to the present value of land and produce, it is by no means his opinion, that a farmer is warranted in risking his capital, by taking land at such a rent as the present prices of corn seem to justify. It has always been his firm and decided opinion, that the only fair and just criterion to judge of the value of land, is, by making an estimate, according to the prices by which the export and import of grain are regulated. The present prices of corn may be attributed to the very peculiar state of Europe, owing to which, for these several years past, our connection with the continent has been greatly impeded; and of course importation from foreign countries made at a vast increase of expence. A continuation of high prices, therefore, depends upon the continuance of war, the corn laws being in fact completely annihilated. Of late, government has found it necessary to encourage importation of grain from every quarter, though it is perfectly plain that, so long as the war continues, prices cannot be reduced to their former level, unless very full crops are obtained at home. Keeping these matters in view, he is firmly of opinion, that no man is warranted in renting land at higher prices, than these rates of import and export will enable him to pay. If his conjectures are well founded, a deduction ought to be made from the above statements, in exact proportion to the difference between the prices by which these statements are made out, and the prices at which the ports are opened and shut; it being on these grounds only, that he considers any man warranted in risking his capital on land, until new corn-laws are obtained *.

* At the same time, it is to be observed, that the quantity of grain im-

No farmer can pay the present rents, taxes, and expense of labour, if wheat is below 90s. per quarter. It has indeed averaged more for the last nine years; but then a farmer is not justified in turning away his sheep and oxen, and breaking up fine pastures, unless he is assured that it will be *steadily* as high, which it will not be under the present laws, if there is a succession of only *average* crops. The high prices of the last five years, have been entirely owing to bad crops, and to our inability to pay for foreign grain, more especially since the year 1810. It is a singular circumstance, indeed, that the scarcity of bullion, and the unfavourable rate of exchange, have thus indirectly contributed to the advantage of the British farmer. It is to be hoped, however, that every difficulty on this head, will be obviated by the new corn system to be proposed in the course of the ensuing session of parliament.

Such statements as these above inserted *, sanctioned by the authority of intelligent practical farmers, must throw great light on the important question of the produce and

ported, forms, in general, but a very inconsiderable proportion of the grain necessary for the consumption of the inhabitants of the country, even in bread, independent of the consumption in beer, in spirits, in feeding cattle, &c. On the other hand, it is contended, that the consequence of these importations is, to reduce the price of British grain much lower than in the proportion which they may bear to the whole consumption. Such are the effects of even a slight variation of the usual state of supply and demand for any article. It may be proper to add, that had it not been for the great improvements which have taken place in agriculture, we could never have fed such an increasing population, so amply, without tenfold additional importation.

* Many farmers in Scotland, more especially those who cultivate a great extent of land, keep regular accounts; but the practice is not so general as it ought to be. Every farmer should annually make up such a statement as Mr Rennie has given.

The expence of farming; also on the rent that land should yield, and the profit to which the farmer is entitled. They are certainly too high for any farm that is not situated in the most fertile districts of Scotland, for it is difficult any where else to get such an extent of land, as from 400 to 500 acres, of equal fertility, and without any muir or bog, or any other sort of inferior land, being intermixed with it.

Secr. III.—On the Proportion of Produce to be exacted as Rent, and on the Mode of Payment.

It has been already observed, that it is essentially necessary to exact a fair, but not an oppressive rent, from the tenant*; such a sum as will have the effect of exciting him to activity and exertion. Without dwelling on the high rents exacted for lands in the neighbourhood of large towns, which are no precedent in other cases, it is proposed to consider, what sum may be fairly demanded for land, under a regular system of arable or convertible husbandry.

Before entering, however, into any detail, it may be pro-

* Mr Wilson of Simprin, near Dunse, observes, that no man can do good as a farmer, who is borne down by being over-rented, or over-taxed; and that these burdens are worse than even a want of capital, for if land is taken worth the money, a careful and industrious farmer will get friends to assist him.

per to observe, that though the rent paid by the tenant is in general no bad criterion of his skill and industry, yet, at the same time, much must depend on a variety of other circumstances ; as, 1. The soil of the farm, and the means of remedying its defects * ; 2. The subsoil, a point of much more importance than is commonly imagined † ; 3. The climate ; 4. The situation as to markets ; 5. The vicinity to coal and to lime, or other extraneous manures ; 6. The means of conveying the produce of the farm, (for good roads make an essential difference in the value of a farm) ; 7. The size of the farm itself ; 8. The position and construction of the house and offices ; 9. The length of lease ; 10. The covenants ; 11. The encouragement given to improvement ; and, 12. The amount of other payments, besides the rent, to which the tenant is liable. Every farmer, before he engages in a new lease, ought to take all these, among a variety of other circumstances, into his consideration.

On the subject of rent in general, there are two points which require peculiar consideration : 1. What proportion of the produce should be paid to the landlord ; and, 2. Whether it should be paid in money, or in kind, or partly in both.

The following are the particulars of the rent paid for a farm amounting to 280 Scotch, or 350 English aeres :

* Clays are improved by a mixture of sand, and sandy soils by clay, which are frequently at no great distance from each other.

† Mr Robertson of Ladykirk observes, that the subsoil of a farm should even be more attended to than the soil. It seldom happens, in a good climate, that the land is unproductive, when the subsoil is dry and good. It is wonderful what even a thin soil will do, when full of manure, if it rests on a sound subsoil.

1. Money rent,	L.4	15	0
2. Half a boll of wheat, (2 Winchester bushels)			
averaged at 40s. per boll, or 10s. per bushel,	1	0	0
3. Half a boll of barley, (2 Winchester bushels)			
averaged at 30s. per boll,	0	15	0
<hr/>			
Total per Scotch acre,	L.6	10	0

Which is equal to L.5 : 2 : 3 per English acre.

This farm, however, is situated in the Carse of Gowrie, which is certainly one of the most fertile districts in Scotland : It is not far distant from the Frith of Tay, a navigable arm of the sea, by which lime may be imported, and the produce of the farm exported, with great facility : The climate of the Carse also, as well as the soil, is uncommonly well calculated for arable cultivation, and less liable, than almost any part of the kingdom, to any agricultural disaster.

There is an instance of a still higher rent in East-Lothian, amounting to L.1710 *per annum*, for only 240 Scotch, or 288 English acres. This is at the rate of L.7, 8s. 6d. per Scotch, or L.5, 14s. per English acre.

The total annual produce cannot be estimated at more than L.3200, which would be at the rate of L.13 : 6 : 8 per Scotch, or L.10 : 13 : 4 per English acre.

These rents totally destroy the old maxim, that every arable farm ought to produce three rents, one for the landlord, one for the expence of cultivation, and one for the maintenance of the farmer*. It might be founded in truth, when first thought of; but since the introduction of

* It was an old Scotch adage, "Ane to saw, ane to chaw, and ane to pay the laird with a."

two-horse ploughs, and threshing-machines, it has not the slightest affinity to the situation of the farmer. Besides, since roads and markets have been so much improved, the sale of every article more certain, the number of horses and servants necessary for an arable farm so much reduced, and every branch of agriculture so much better understood, the landlord is entitled, *at least in fertile districts*, to a larger proportion of the produce.

What proportion of the produce of arable land ought to be paid as rent to the landlord, is a question that has long been considered as abstruse, mysterious, and very difficult to resolve. In the year 1753, it was recommended to the attention of the public, by the Edinburgh Society for the improvement of Agriculture, but no person ventured to discuss it, in consequence of that recommendation, until after the lapse of twenty years, when the late Alexander Wedderburn of St Germain, father of the celebrated Chancellor Wedderburn, Earl of Rosslyn, published his essay on that subject, in the year 1766. In that work, Mr Wedderburn justly observes, that no blind bargain ought to be concluded between the landlord and tenant, for there are rules and principles, by the fair application of which, the rent that ought to be justly demanded for arable land, may be ascertained with tolerable precision. It is a bad system, he remarks, when parties, whose interests are so clearly interwoven together, meet rather like enemies than friends: the natural consequence of which is, that he who is most skilful in the arts of deceit, obtains a disgraceful victory. As a foundation for a proper system on this subject, Mr Wedderburn contend-ed, that land producing on an average 8 bolls of wheat, 3 of peas, $6\frac{1}{2}$ of barley, and $4\frac{1}{2}$ of oats, or at the rate of $5\frac{1}{2}$ bolls per Scotch acre overhead, together with 165 stones of hay, might be considered as a standard; the va-

the value of which, on the average of twenty years preceding 1754, produced L.300 *per annum*, which admitted a division of its produce into three parts, one for the landlord, one for the tenant, and one for the expence of cultivation. Where the produce was less, the expence continuing the same, the estimated surplus, he proposed, should be equally divided between the landlord and the tenant; but when the produce was more, the surplus, beyond the one-third part of $5\frac{1}{2}$ bolls *per acre*, he affirmed, should go to the landlord, as explained by the following table.

Bolls per acre.	Value of product.	Expence.	Rent.	Farmer's profit.
5 $\frac{1}{2}$	300	L. 100	L. 160	L. 100
6	340	100	140	100
7	381	100	181	100
8	436	100	236	100

Such calculations, however, were only suited to the miserable state of agriculture at the period when Mr Wedderburn wrote. At that time, 126 Scotch, or 144 English acres, of arable land, were reckoned the proper size of a farm, and the capital required to stock it was estimated at only L.200, or at the rate of L.1 : 13 : 4 *per Scotch*, and L.1 : 7 : 9 *per English acre**. Had the capital required for farming continued at the same rate; had the expence of cultivation remained in the same proportion; had no allowance been made for erecting threshing-mills, purchasing lime, &c.; and had the principle been

* See an Essay upon the question, "What proportion of arable land ought to be paid as rent to the landlord?" by Alexander Wedderburn, Esq. of St Germain, printed at Edinburgh, anno 1770. Page 6 and 10.

adopted, that the profits of the farmer should not exceed L.100 *per annum*; what would now have been the state of the agriculture of Scotland?

The French economists adopted a mode somewhat similar, for estimating the amount of rent. They gave, what they called the *produit net* to the landlord, by including the farmer's profit among the expences, and, deducting the total expence from the total produce, the net remainder they accounted the proper rent for the landlord to receive.

It is evident, that such *nice calculations* are not suited to the peculiar situation of the farmer, whose crops are precarious, who has no certainty of the prices he is to receive for his produce, and who may be often disappointed in his payments, from the failure of those to whom it may be sold; and it is quite absurd to apply the same rules to all situations, soils, and climates, in all the various districts of an extensive country. I am induced, therefore, to submit to the consideration of the reader, the following hints, on which some average calculation may be formed, for the mutual advantage of the landlord and tenant; the balance, whenever there is the least doubt, being always given in favour of the tenant.

Poor land cannot possibly pay the same *proportion of rent*, according to its usual produce, as the rich and fertile. Some land may yield, on an average, at the rate of L.15 *per acre, per annum*, and upwards; some at the rate of L.10 *per annum*; and some at the rate of L.5, and even less. The labour of ploughing, harrowing, &c. when the land is in cultivation, is nearly the same, and yet the produce is greatly inferior, not only in quantity, but in quality. The rent, therefore, ought not to be in the ratio of the produce. Perhaps a fair proportion might be, two-

~~two-fifths~~ of the produce in the first instance; one-third in the second; and one-fourth in the third.

Or,

	Per Scotch acre.	Per English acre.
1. Rent of land producing L.15 <i>per annum</i> , at two-fifths,	L.6 0 0	L.4 16 0
2. Rent of land producing L.10 <i>per acre</i> , at one-third,	3 6 8	2 12 6
3. Rent of land producing L.5 <i>per acre</i> , at one-fourth,	1 5 0	0 19 8

For inferior produce, perhaps one-fifth might be sufficient*.

The following table gives a view of the expence and profit of each of these descriptions of soil:

	Produce.	Rent.	Expences and profit.
No. 1.	L.15 0 0	L.6 0 0	L.9 0 0
No. 2.	10 0 0	3 6 8	6 13 4
No. 3.	5 0 0	1 5 0	3 15 0

The difference, in regard to expence and profit, is cer-

* It is remarked by Mr Stewart of Hillside, that the rent ought to depend upon other circumstances as well as the proportional quality of the soil and quantity of produce. Lands of a good soil and subsoil may be so high situated as to make the crop greatly more precarious, and the grain inferior in quality, and it may be distant from lime and from markets. This will add greatly to the expence of management, and must lessen the price of the produce. In these high-situated farms, turnips will often grow luxuriant, but they cannot be depended on for the whole of the winter months, and seldom or never in spring, unless they are stored. They become the more precarious, that they must be sown early in the season, of course they are the more subject to be frosted. Ruta baga, however, or Swedish turnip, is not liable to this objection.

tainly considerable, and much in favour of the more fertile soils. The difference between No. 1. and No. 2. is L.2 : 6 : 8 per Scotch acre, between No. 2. and No. 3. L.2, 18s. 4d. and between No. 1. and No. 3. L.5, 5s. But the difference, though not entirely, yet is in a great measure made up, by the different charges attending the management of each sort of land. Fertile land is more constantly worked, and consequently requires a greater expence. Land paying L.6 per Scotch acre, is perhaps under the rotation of, 1. Fallow ; 2. Wheat ; 3. Clover ; 4. Oats ; 5. Beans ; 6. Wheat ; whereas the land paying L.1, 5s. of rent, has the following crops :—1. Turnips ; 2. Barley ; 3. Clover ; 4. Pasture ; 5. Pasture ; 6. Oats ; consequently, in the same number of years, the expence of manure is doubled, and three years, instead of one year, is in grass. By these means, the expence of cultivation is greatly reduced.

It is to be observed, that these calculations are intended for land in an arable state, (grazing farms must be let on principles totally different, namely, according to the quantity of stock they can maintain ; and that the rent is supposed to be in full of all demands exigible from the tenant.

It has been contended, that as both the expence of cultivating land, and the value of its produce, are infinitely various, a farmer ought to calculate, what profit he can make, *on his whole farm*, without entering into details ; it being of little consequence to him, whether he pays at the rate of L.10, or 10s. *per acre*, provided he makes an adequate interest *on the capital invested*. That is certainly a fair criterion on which a tenant may calculate what he ought to offer ; but a landlord, in estimating the rent he ought to demand, must take into his consideration the produce that his land is capable of yielding, and what proportion of it, or its value at a fair average, he has rea-

son to expect, under all the circumstances of the case. A timid or penurious tenant, unless spurred on by an adequate rent, may not lay out the capital he ought, on the cultivation of his farm.

2. In regard to the mode in which rents should be paid, I have no hesitation in stating, that a part of the rent ought to depend on the price of grain, not at the moment, but at the average of ten, or of twenty-one years, striking off the first, and adding a new one every year. Without some such arrangement, the tenant, on the one hand, cannot make a fair offer of rent, lest the price of grain should fall too low; nor, on the other, can the landlord grant a lease of considerable duration, lest the price of grain should, in the progress of time, rise much higher. It is for the interest of both parties, therefore, that whilst one half of the rent should be payable in money, the other half should be converted into corn, not payable in kind, but in money, according to the average value of a number of years *. From a farm already improved, the rent payable

* Dr Young of Stonehaven, an able correspondent, has sent me the following instance of the injury which a landlord received by injudiciously converting a large proportion of grain into a money rent. A farm was let in lease previous to 1765, at which time the rent was 29 bolls of meal, 14 bolls of bear, services which would now be worth L.15, and L.5 of money. On the letting in 1765, the whole was converted into money, and a small advance of rent given. In 1784, the farm was re-let, and another advance of rent given, on a lease to endure for 57 years. The rent fixed at the last letting, to continue for the long period mentioned, was L.28. Hence there is now the following difference, at a moderate valuation:

29 bolls of meal.....	L.29	0	0
14 bolls of bear.....	14	0	0
<hr/>			
Carried forward,...	L.43	0	0

half in money, and the other half according to the value of a certain quantity of grain, on a continually changing ten, or twenty-one years' average, may continue indefinitely to landlord and tenant. The question, however, is attended with some difficulties, which are ingeniously stated in a paper in the Appendix, (No. XXXIX. p. 170.)

Instead of a corn rent, some recommend an increase of money rent at regular periods; and this plan is necessary, with a view to improvement, where longer leases are granted than for twenty-one years. In such cases, a low rent at first, enables the farmer to carry on his operations with less capital than otherwise he would require, and he is afterwards enabled to pay, without difficulty, a moderate addition, as the farm gets into good order. How much better for the landlord to adopt such a plan, than to require an enormous rent from the beginning, which would crush the spirit of the farmer, deaden his exertions, check the improvement of his property, and ultimately retard its

Brought forward,	L.	43	0	0
Services.....		15	0	0
Money.....		5	0	0
		<hr/>		
	L.	63	0	0
Present rent.....		28	0	0
		<hr/>		
Difference or actual loss to the landlord.....	L.	35	0	0

So that, valuing grain moderately, the present rent is less than what it would have been, by more than one-half, had the same rent continued, as paid upwards of 50 years ago. This is strongly in favour of a rent partly payable at least in the value of grain. Indeed, considering the great import of corn, and the rapid increase by the culture of potatoes, by both of which the price of corn is so materially diminished, some are of opinion, that even a corn rent, unless varying every seven or ten years, is not a sufficient protection to the interests of the landlord.

reaching its full value, and consequently its yielding an adequate rent.

It may be proper to add, although not strictly belonging to the subject, that notwithstanding the high rent paid in Scotland, which renders the prospect of any additional rent more unlikely, yet land sells at a considerable price, or number of years purchase on the improved rent, from a conviction of the superior advantages of possessing landed property in that country. The following table contains a statement of the sale of several estates in the immediate neighbourhood of Cupar, the county town of Fife, and which all took place in the course of the year 1809.

Names of the Estates.	Number of Scotch acres.	Number of English acres.	Price.	Names of the Purchasers.
Dairsie,	320	384	L.28,500	Traill, Esq.
Spring Garden,	82	98	14,500	Col. Don.
Cairnie,	400	480	32,000	Gillespie, Esq.
Kilmarnon,	270	324	26,000	Capt. Maitland.
Hilton,	250	300	20,500	Lord Leven.
	1322	1568	121,500	

Which is at the rate of L.91, 18s. per Scotch, or L.73 per English acre *. Land often sells much higher in small

* The estate of Eccles, in Berwickshire, was sold in 1803 at about L.26,600. It is now resold at L.48,000. It contains 630 English, nearly 504 Scotch acres. It ought therefore to be let at the yearly rent of L.1920, to yield 4 per cent. for the price, the common rate of lands in this country when they are purchased. The rent would thus be brought to L.3, 16s. per Scotch, or L.2 : 14 : 11 per English acre. The last price, however, has been found too high.

lots, more especially near large towns; *but to have such a number of acres, sold at such a price, at such a distance from the metropolis of Scotland, is rather extraordinary.*

SECT. IV.—On the Advantages of Leases, their Duration, and the Covenants to be inserted in them.

It is impossible to expect that any farmer will undertake to increase the value of the property of another, without the certainty of having the land he improves in his possession, for a term of years, sufficient, not only to repay his expenditure, but also to reward him for his skill and industry in making the improvement *.

When a farmer of spirit and capital enters into the pos.

* Mr Curwen has very ably observed, that example, and improvements in agriculture, are of little consequence to a farmer, without a lease. He is precluded from adopting them. Whatever advances the value of his farm, beyond the state in which he took it, renders his tenure more insecure. If he wishes to keep his farm, it must not appear to be above the scale of moderate advantage. If his exertions shew it to be capable of improvement, he hazards the loss of it. How much is lost to the public by this narrow and stupid policy!

Mr Shirreff remarks, that the improved husbandry of Scotland may in a great measure be attributed to the free agency of the tenantry, under the liberal system of leasing, so general in that country. Had the tenants, in the northern part of the kingdom, been under the perpetual harassment and control of pettyfogging stewards, unacquainted with country business, as the yearly tenants of England are, they would still have been in the same state of torpor and depression, in which that description of people must remain, under existing circumstances.

session of a farm, on a lease of 19 or 31 years, what a scene of industry and exertion commences ! The whole neighbourhood, and even distant counties, are ransacked for good stock ; the best instruments of husbandry are purchased ; the fields are thoroughly ploughed and cultivated ; the fences are put into good order ; lime and other extraneous manures are provided in considerable quantities ; the necessary drains are carefully attended to ; and the whole is carried on, *in the spirit of commercial speculation*, with a view of securing, not only indemnification for actual outlay, but also considerable profit before the expiration of the term. Can any plan be more advantageous to the tenant, to the landlord himself, or to the public ? The tenant lays out his capital with spirit, but with more attention to economy, than if the land were his own ; and when judiciously laid out, he will ultimately derive more certain profits for the sum he has expended, than the manufacturer, or the merchant. The proprietor gets a fair rent for his land, has the satisfaction of seeing his estate in a progressive state of improvement, and has the prospect of a considerable addition to his own income, or that of his family, when the lease he has granted is at an end. The public is benefited in various ways, and, above all, in having from one-fourth to one-third, and in some cases one-half, greater produce, than if the land had remained in its former state of precarious tenure, at the will of the landlord ; in which case, the tenant has no spur to any exertion, beyond common industry, and no temptation to lay out any sum beyond what is actually necessary for the preservation of his farm, in a state of common, instead of superior, cultivation.

Such are the advantages, which in general are to be expected from the granting of leases. We shall now proceed to consider the most important particulars connected with

that interesting subject, namely, 1. The principles or basis on which they ought to be founded ; 2. The manner in which the transaction is usually carried on and concluded ; 3. The duration of leases ; and, 4. The covenants to be inserted in them.

1. On the Principles on which Leases ought to be founded.

As the basis of a connection between the landlord and tenant, during a term to be agreed upon, it is contended, that the landlord should have the very utmost rent which a farm can afford, in an open and fair competition ; and that the tenant should have the full use of the farm unrestricted, (at least until the last three years of the lease), for the purpose of enabling him to pay that rent. In other words, that there should be a complete alienation of the property, during the period agreed upon, subject to a certain annual payment ; the contract resembling a temporary feu, rather than a lease, and the landlord, instead of being the proprietor and guardian of an extensive property, becoming, in a manner, a mere annuitant on his own estate.

If men were uniformly distinguished for integrity of conduct, such a principle, to a certain extent, might be admissible ; but it is impossible that any prudent landlord can place such unbounded confidence in a person, with whom he is supposed to have *only a commercial connection*, and who has an interest to do him a most essential injury ; for the more he exhausts the estate, the more he may ultimately enrich himself. Indeed, the higher the rent, the greater is the temptation to destroy the fertility of the soil, more especially towards the close of the lease. It is therefore better for the landlord to have a less rent, and

more security for the property leased out. Covenants are, in fact, a species of rent ; and though they may diminish the annual income, yet, if judiciously planned, they will add to the permanent value of the estate, or will, at least, prevent its deterioration. The landlord, as before observed, is a trustee, both for his own family, and for the public, and he is bound to take care, that neither shall suffer, from any improvident confidence he may be disposed to place in any one individual. Indeed, endeavouring to carry the principle of leasing to such an extent, may have the unfortunate effect, of preventing the granting of leases altogether, to which too many landlords are at present indisposed. The true principles of leases seem to be “ an agreement, where the proprietor does not endeavour to exact a higher rent than the land can well afford to pay ; where the tenant has every inducement, from the encouragement he meets with, to increase the value of all the land he occupies, insomuch that he will be able to afford, even a higher rent, when the lease terminates ; and where, instead of a mercenary contract, a connection, for the mutual advantage of both parties, has been entered into, which, if the tenant fulfils the expectations which are entertained of his exertions, is likely to be continued.” In short, that great object, both for the public, and for the proprietor and his family, “ *the progressive improvement of an estate,*” ought not to be sacrificed, for the hazardous experiment of obtaining a temporary advantage, at the risk of future injury.

**2. On the Manner in which the granting of a Lease is begun
and concluded.**

The next point to be considered, is the manner in which

the negotiation ought to be commenced, and brought to a conclusion.

The first rule to be laid down is, that a new lease should, if possible, be arranged two or three years before the expiration of the old one. This is for the interest both of the proprietor and of the public, and likewise of the farmer, whether a new one is to be introduced, or the old one is to be continued. It is attended with much inconvenience and loss to either, if the farm is permitted to remain in the market, till within a few months of the expiration of the old lease.

If the farm is taken by the old tenant, (and if he is not particularly faulty, he should, at that time, be preferred, on equal terms), his management goes on regularly, and he must be a gainer, whilst the landlord profits, by warding off the scourging of the three or four last years of the lease. If the new tenant is a stranger, the subsequent management may indeed affect his interest; but, on the other hand, he will become better acquainted with the quality of the soil; he will have more time to prepare stock,—he may perhaps agree with the old tenant to enter before the expiration of the old lease; and if this cannot be effected, his own interest will make him look sharply after the management, and he will be more watchful than the landlord usually is, to see the conditions of the old lease strictly fulfilled. It is well known, that the first years of a new lease are almost always employed in repairing the damages of the last years of the former one. This is a much more serious evil, to all the parties, than has been generally imagined, and no restrictions will ever prevent it, unless a sense of interest is combined with them, which, by one or other of the measures above suggested, may be accomplished.

Where the terms of a lease are not settled with the old

tenant, one of three plans may be adopted; private offers; public competition; or a fair valuation by the landlord.

In regard to the first, the plan of private offers, accompanied by a promise of concealing the names of the bidders, it is highly exceptionable. It gives an opportunity of gratifying private enmity and revenge. It certainly occasions unnecessary suspense; and the consequence sometimes is, that a candidate does not only bid far above others, but even returns again to the charge, and overbids himself. This method also excites much suspicion, whether justly or not, is immaterial, as the effect is the same; and such a state of mind is not desirable at the commencement of a lease. Besides, it necessarily gives an opportunity to stewards, factors, and agents, to be guilty of duplicity and favouritism.

The plan of setting up a farm to public auction, is preferable to the system of private offers; but it has a tendency to raise the rent too high, and furnishes mere adventurers with an opportunity of coming forward. The landlord, however, may either reserve power to take any one of the two or three last offerers, or he may stipulate, that security shall be given for the first year's rent, (the right of hypothec securing the remainder), and for any articles the new tenant is to receive.

The proper plan, however, for a landlord to adopt, is to have any farm to be let, valued, by the most intelligent person he can find out, and not to demand beyond the sum he fixes on. Such a valuation ought not to be hastily or superficially done, nor ought the value to be estimated, according to the fertility of the soil alone, for it must depend on a variety of circumstances, already pointed out. (See p. 196.) Let the farm be offered at that rent, for 19 or 21 years, and let that tenant be preferred, "*who will stipulate to make the greatest exertions for the improvement of*

the estate." In this way, the interest of the farmer, of the proprietor and his family, and of the landlord, "are all combined."

3. Duration of Leases.

The duration of leases must certainly differ, according to a variety of circumstances. If a farm is almost in a state of nature, and requires inclosing, liming, draining, and other expensive improvements, and perhaps the expenditure of a considerable sum for erecting and repairing a house and offices, a lease of twenty-five, and in some cases even of thirty-one years, may be necessary, to allow the improving farmer, or his family, a fair and adequate return *. A spirited tenant, who takes a farm of that description, considering his risk, trouble, and expence, is well entitled to more than mere remuneration, or ordinary profit †.

* It is objected to such a length of lease, that the improving tenant will probably have died before the lease terminates; that his heir may be minor, and may not possess the skill and talents of his predecessor. It is more likely, however, that a son will succeed, trained up to skilful husbandry under his father's eye.

† Mr Neil Bailingal took a farm of 380 Scotch, or 482 English acres in the county of Fife, at 15s. per acre, on a lease of 31 years. The whole of it required draining, liming, fallowing, &c. at an expence, varying from £10 to even £20 per acre. The whole improvement, owing to the extent of the farm, and the great expence attending its improvement, which the tenant could only gradually defray, was not completed till the nineteenth year of the lease. Can a stronger proof be adduced of the absolute necessity of granting a lease of 31 years, in similar cases? The farmer was no gainer, even at the low rent of 15s. per acre, for the first 19 years, expending, on completing his improvements, the profits derived

In regard to a farm that is even considerably improved, a lease of nineteen, or perhaps twenty-one years, is also necessary; but these periods, in such a case, ought not to be exceeded. Unless specific improvements, expensive, and, at the same time, little profitable to the tenant, are stipulated, the common duration of nineteen years is enough; even though one-fifth part of an arable farm, of considerable extent, requires improvement, if that fifth be of a nature to *encourage* the attempt, and if the tenant has capital, begins in time, and goes on with spirit. The produce of the lands themselves, will yield a sufficient *bonus*, in the duration of a common lease of nineteen years. If it is extended to twenty-one years, the tenant is certainly safer. Such a term, however, is necessary, because

from the parts already improved; but he went on with cheerfulness, expecting to be reimbursed by the possession of a completely improved farm, at a moderate rent, for eleven years, capable of being cultivated by half the number of men and horses formerly used, actually maintaining double the number of cattle, and producing three times the quantity of grain it was capable of doing before the improvement commenced;—all this at 15s. per acre, insured a competent reward for his exertions.

As another proof of the advantages of long leases, in promoting improvement, it is said that the greatest outlay of farming capital on building, inclosing, and improving the soil, has been where fifty-seven years leases were granted, above twenty years ago, on the lordship of Needpath, belonging to the late Duke of Queensberry. The estate was all let for grangums, or fines, which no doubt considerably reduced the farmer's capital, yet a power being granted to assign or subset, it gave security for borrowing. The expectation of a long lease, afforded large scope to permanent amelioration; every species of which was executed at the farmer's expence. This, nothing but the length of the lease, and the hopes of a distant return, could have justified. The great improvements which took place in the Ormiston estate, in consequence of long leases, are too well known to require any particular discussion.

no farm can be in such a state of perfection, as to require no further improvement. New modes may be necessary, in consequence of new discoveries in agriculture, or unforeseen alterations in the political circumstances of a country. Unless a farmer, however, has his possession secured to him, he can have no inducement to try any experiment whatever, and agriculture, in that case, must remain for ever stationary. A man who has a considerable capital also, and wishes to employ it in extensive farming, has a right to look for the comforts and conveniences of life for himself and family; and if he finds he can have no security for them in that line, (which he never can do, if he is liable to lose his farm every year, or in the course of any short period of time), he will most assuredly renounce so unpromising a profession, and employ himself and his capital in some other way. Leases of considerable duration, therefore, are to be considered a most essential requisite towards promoting the interests of agriculture, *in all cases*; and it can hardly be doubted, that, to the granting of leases, the security they give to the farmer, and the inducement they hold out to men of liberal education, enlarged ideas, and extensive capital, to engage in that profession, the present flourishing state of agriculture in Scotland is to be imputed, more than to all other causes whatever.

So forcibly do these considerations (for which I am indebted to a most respectable correspondent, Robert Walker, Esq. of Wooden, in Roxburghshire) strike my mind, that, if it were not on the whole impolitic for the legislature to interfere with the management of private property, I should think it a measure entitled to consideration, the propriety of imposing a heavier land-tax, where farms are not under lease, than where they are, as a penalty on the proprietor, for not promoting the improve-

ment of the country, and the happiness, and independent spirit of those who live under him *. The tenant, in some cases, is as much to blame as the landlord, by not applying for a lease. Wherever the tenant does not wish for a lease, it is evident, that his object is, to remain in a state of torpor, and not to excite any expectation of additional rent, by any attempt at improvement.

On the subject of leases, nothing can be stronger than the following opinion, delivered by a most respectable and intelligent country gentleman, (William Robertson, Esq. of Ladykirk), whose property is considered to be one of the best managed in Scotland. His words are, “ When the proprietors of land in England find it convenient to let leases of sufficient endurance, then the rent of land will find a just level, and the consequence will be, the improvement of husbandry. Until that is done, all other matters, connected with the amelioration of the soil, must in a certain degree be stationary.

It must not be imagined, however, that leases ought to be indiscriminately given. They certainly ought not to be granted, but where a farm is of a proper size, and is put into a shape for profitable cultivation, and where tenants

* The same idea has occurred to Mr Curwen. He says, a question arises, Has the proprietor the sole and entire interest in the land he possesses? In China, most undoubtedly, the laws shew the very reverse. The principle of the law is also here against it. The law recognizes, where there are two concurrent rights, that neither of them shall be exercised so as to be injurious to the other. If the withholding leases should extend so far as to become general, would it not be fully justifiable to impose such a tax as should meet and correct what would be so injurious to the community at large? Still, however, any interference with the management of landed property is to be deprecated.

also can be found, possessed of skill, spirit, and capital.—The improvement of an estate may be retarded, instead of being promoted, if leases are given of ill-arranged occupations, and to ignorant, slothful, and needy farmers, not entitled to that honourable appellation. Nor ought leases to be granted, (being, in fact, during the period agreed upon, a species of alienation of property), without proper covenants, protecting that property from waste.

Far less are leases of an indefinite length, as for one life, or for several lives, to be recommended. Experience has fully demonstrated, that any uncertain period is injurious to improvement, and that nineteen or twenty-one years is a fair term, in an improved country, enabling the tenant to lay out his money with the prospect of a profitable return. When the length of a lease is fixed, the tenant makes his arrangements accordingly, and he lays out his capital early, in the expectation of having a greater return before the termination of the lease; but when the term depends upon his own life, he is apprehensive, that if he spends a large sum of money, the benefit of it may be lost to himself and family, from the uncertainty of human existence. He lays out no part of his capital, therefore, but in the expectation of immediate returns; and the longer he lives, he becomes the more negligent, and the less inclined to exertion.

4. *Of Covenants in Leases.*

When a lease is granted, more especially of any duration, it is essentially necessary for the interest of the landlord, who is properly a trustee for the public, that it should be under such covenants, as may prevent the property from being injured, instead of being improved, more espe-

cially when the lease approaches to its termination, and the tenant has no peculiar inducement to prosecute his improvements. In general, the covenants in leases, which are a species of rent, are too complicated, and too numerous. Unnecessary restrictions in a lease are a great impediment to improvements, by precluding a spirit of enterprise, and of experiment, which have proved the principal sources of new discoveries, and of prosperous agriculture. At the same time, where there are no covenants, calculated for preserving the farm in good order at the termination of the lease, or providing for a certain proportion of grass, a certain quantity of land to be reserved for the incoming tenant, for turnips or summer-fallow, nor the fodder of the last crop; in that case, the crop of the outgoing tenant, (who takes care to plough every thing he can), may be sold off by public auction, and the farm left in poverty and wretchedness. This has often happened to negligent landlords.

Among the covenants necessary for their protection, without imposing any unnecessary restraint on the tenant, the following are the most essential.

1. The lease to go to the tenant, and the heir or person succeeding to him in the larger share of his property, and the farm not to be divided into smaller portions, without the consent of the landlord.

It is supposed, when a farm is let to one individual, that it is of a proper size, or standard, any diminution of which might be highly inconvenient, if not ruinous, to the farm. For instance, if a farm is divided into six fields, under a rotation of six shifts, or breaks, it would be in the highest degree prejudicial, to have one of them taken from the farm, and let to another. It may be proper also, in the event of the death of the original tenant, that the farm should go either to the widow or to the eldest son, or to

any one of his children to be named by the father, to prevent that jarring of interests, which must inevitably injure the cultivation of the land, and probably bring the whole family to ruin. This was suggested by an intelligent legal correspondent, who has seen infinite mischief done to a farmer's family, where this precaution was neglected. At the same time, such a stipulation is not inconsistent with the idea, that the widow, or the son who is preferred, may be obliged, by the father's will, to account to his family, for the profits of the capital expended for their joint behoof; and instances can be adduced, where the net proceeds are thus divided, in certain proportions, among the members of a farmer's family, and where the farm is as well managed as any in the neighbourhood.

2. If the tenant or his heirs wish to give up the farm, or are compelled by bankruptcy to renounce the possession of it, in that case, one of two plans may be adopted; 1. Either the landlord shall have the preference, at a surplus rent or price to be determined by arbiters mutually chosen, or appointed by the sheriff of the county; or, 2. It may be agreed upon between the parties, that the lease shall be assignable, or the farm sublet, for a certain surplus rent, and not for any premium, *5 per cent.* of which surplus rent shall be payable to the landlord, as an inducement to him to grant that privilege; it being understood, that the original rent was rather lower than might have been obtained, had the farm been put up to auction.

Such a power of subletting, it is said, would tend to throw much additional capital into the agricultural profession, as active men, possessed of funds for the purpose, would more readily embark in a business in which they could make progressive advances in wealth, as a merchant, instead of being confined to mediocrity, as every farmer

must comparatively be, who is tied down, for nineteen or twenty-one years of his life, to the improvement of any particular farm whatever. A surplus rent is preferable to a premium, because the latter would exhaust the capital of the incoming tenant. Besides, if the heirs or creditors of the former tenant, have a certain surplus rent once ascertained, there is no difficulty in getting it disposed of at its value in the market, and the price may perhaps exceed what the incoming tenant would have offered.

3. All mines, minerals, metals, coal, peat, marle, limestone and quarries of all kinds, to be reserved to the landlord, with power to him, or those authorised by him, to search for, work, and take out, all, or any of these, in any part of the lands, and to carry them off at any time; and also to make roads, aqueducts, and levels, and to erect houses and machinery, when and where he may judge requisite for such purposes; the tenant being always allowed deduction from his rent, or to be otherwise paid, for any actual damage * done to his grounds, and loss occasioned to him by any of these operations, as the same shall be ascertained by two neutral persons of skill, to be mutually chosen.

4. Full power reserved to the landlord, to make or alter roads through the lands, for the accommodation of his estate; to form or repair boundary fences, to make em-

* I think, in fairness to the tenant, if he gives the full value for the *land*, that it should be *actual*, and not *surface damage* alone. If the tenant does not get actual damages, he does not get *fair* damages, that is, compensation for damages or loss sustained. Powers should be reserved to the tenant to quarry for stones, when they are to be employed upon the farm in building, draining, &c. to dig peats for fuel, to quarry lime, or to dig marle for manure, for the use of the farm, but not for sale.

bankments against injury from the sea, from lakes or rivers, and also to straighten boundaries, and to exchange lands for that purpose, either with any of the neighbouring proprietors, or with any of his other tenants, not exceeding one-twentieth part of the farm let, or any portion of it specified in the lease. The actual value of the ground taken away, or thrown into the farm, by these means, after being ascertained by two indifferent men to be mutually chosen, shall be deducted from, or added to, the rent. Where there is any reason to imagine, that the new roads, or the exchanges made, are done invidiously, the arbiters, in such cases, to be authorised to give a permanent deduction of double the rent.

5. The landlord reserving a right to cut and carry away growing timber, and also at any time, during the currency of the lease, to assume possession of any part or parts of the lands which he shall choose, for being planted with trees, or for building houses, or for other purposes, provided the ground so taken shall not exceed a number of acres to be specified in the lease, the situation and boundaries thereof to be described, in the most distinct and unequivocal terms, in the deed, that any material injury to the farmer, in carrying on his operations, may be prevented. For the land so resumed, the tenant shall be entitled to a deduction from his rent, according as the same shall be settled by indifferent men, to be mutually chosen; the proprietor being bound to inclose, at his own sole expence, the land so planted, and to keep such additional fences in repair *.

* It seems unjust to throw any share of the expence of making or repairing such fences on the tenant, as the whole benefit of the plantations goes to the landlord, unless where the plantations, and the fences

6. The landlord reserving all fish and game on the farm, with the sole right of fishing, fowling, and shooting, by himself, his gamekeepers, or others having his authority in writing *; but always so as not to injure the land, fences, or any sown or planted crop, and being liable to make a recompence for the same, at the arbitration of two neutral men mutually chosen. On the banks of rivers, the preservation of salmon and salmon-fry ought to be peculiarly attended to.

7. The landlord reserving power, if at any time the houses, fences, gates, and drains on the farm, shall be found *in great disrepair*, to cause the same to be put in proper order, and to charge the tenant with the expences thereof, unless he (the tenant) shall execute such repair within six months after being required so to do, by a notice in writing †; or denies the necessity of such repairs,

connected with them, inclose and divide the farm in a proper manner, and consequently on that account, and from the shelter they yield, are advantageous to the tenant himself.

* Perhaps the right of riding or walking in any field, when in pasture, more especially if contiguous to a mansion-house, ought also to be reserved. An eminent lawyer once said to his tenant, "I cannot go, without your leave, into that park you rent from me, though it is at my own door."

† It is impossible to limit the time for executing repairs to a short period, for instance, one month. The mechanics or labourers in the vicinity might be previously engaged. A fall of snow or intense frost may render it morally impossible even to commence the repair of either fences or drains, with a fair prospect of executing them economically, or even in a business-like or substantial manner, within that space of time. Harvest and seed-time should also be excepted. It is contended, indeed, that the clause should be cautiously worded, so as to prevent its being turned to the worst purposes, those of oppression. Arbiters, if necessary, should determine whether such repairs be wanted, else a tenant may be injured by the mere

in which case the necessity thereof must be settled by arbitration *.

8. The farm to be cultivated, manured, and cropped in a fair and regular manner. One-fourth in turnip soils, and one-sixth in clay lands, to be in grass, and the same proportions of the farm to be left in grass, properly sown down with clover and grass seeds, and that in regular fields or divisions, each consisting of at least acres. During the three last years of the lease, one-fourth part of the land in tillage to be under a fallow or a green crop, sown in drills, and properly manured with lime or dung, and no two crops of white grain to succeed each other, without a fallow or green crop intervening, unless justified by peculiar circumstances, or some unforeseen necessity; in which case it may be permitted, for one year, if the required proportion of land in grass, and green crop and fallow, is produced in another part of the farm.

9. All the straw growing yearly on the farm, to be consumed on it, and the dung made therefrom to be regu-

ignorance of a landlord, with fair intentions. But if the landlord should be *in malo animo*, what else but eternal vexation, and enormous expence, is to be expected, without benefit to either party?

* Some recommend, that in addition to this general power, there should be fixed periods when the proprietor, either by himself or others, should ascertain the state and progress of improvements, with respect to inclosing, &c. By this means, he will see whether the conditions of the lease are fairly fulfilled, and will have it in his power to stimulate the exertions of an indolent tenant, and regulate and correct the injudicious operations of an unskilful one. But this can only be necessary where the tenant is of a doubtful character. Some are of opinion, that the best plan of effecting this object, is to oblige the farmer to state yearly in writing, if called for, the mode in which every separate field has been cropped the preceding year.

learly laid on the lands; but in case a certain quantity of dung has been brought in the course of any one year to the farm, from any neighbouring town or village, a certain quantity of straw may be sold from it, either the succeeding year, or the one after.

10. The tenant, in turnip soils, to leave at least a third of the lands in grass, of one, two, and three years old, all laid down with the crop after summer-fallow or turnip, with liberty to sow grass seeds among the whole of the last grain crop, to be covered according to the custom of the country; to prepare, at a reasonable price, a sufficient breadth of ground for turnips or summer-fallow; and the stable-yard manure, made during the winter preceding the last crop he grows, to be left, and paid for at a fair value. On rich arable land, one-sixth part to be in grass of one year, and one-sixth of two years, and one-sixth prepared for fallow or turnips; and if the soil is clay, one-sixth in beans may be fairly stipulated, for the three years preceding the termination of the lease.

11. The straw of the last crop to belong to the incoming tenant, in lieu of the expence of cutting down the crop, and the dung of the last crop to be left on the farm, and sold to the incoming tenant, at the average price of the district, provided the outgoing tenant paid for the dung at his entry.

12. The tenant to make good any damage that may be occasioned by fire; and for the greater security of the landlord, the tenant to keep his houses and offices constantly insured, in some respectable insurance office, to the extent of at least . Such insurance to be at his sole expence, the evidence thereof to be produced when required; and in case of neglecting such insurance, for the space of six months, after due notice, in writing, a penalty of L.50 to be exigible.

13. The rent agreed upon, to be payable by equal portions, half yearly, at the usual terms in the months of May and November.

These terms are fixed upon for the better security of the landlord, and to prevent embezzlement of the crop; but three months additional time is in general allowed to the tenant, to dispose of the produce of his farm *.

14. All personal services to be abolished, but the tenant to become bound to make, or to repair, a certain extent of the roads belonging to the farm, if necessary.

15. All disputes between the landlord and the tenant to be settled by the arbitration of one or two men mutually chosen, and, in case of variance, the arbiter or arbiters, if they judge it necessary, shall submit the case to the judgement of some eminent counsel, at the mutual expence of both parties, whose opinion shall be final.

These hints (some of which are extracted from the articles of lease recommended by the intelligent Professor of Agriculture, in the University of Edinburgh, Dr Coventry) will sufficiently explain the covenants which seem to me essential, in almost every lease. Peculiar circumstances may render additional ones necessary; for instance, not to break up old pastures, without paying a very considerable additional rent, &c. though, as there are few old pastures in Scotland, such a covenant is seldom necessary. There is nothing, however, less to be desired, than to make such a deed or instrument too long, or the restrictions in it too complicated, or to deprive the tenant of all freedom of exertion, whilst he is carrying on his improvements. With

* Where the clergyman of a parish receives grain in kind, the tenants on an estate ought to furnish the quantity to be paid, in proportion to their respective possessions, to be allowed for it as part of their rent.

regard to management in general, the stipulations, at the commencement of the lease, should all be of a *negative* tendency ; *i. e.* the farmer should only be restricted from following a mode that is *generally allowed* to be injurious, but left to adopt any new or improved line of management that may fortunately be discovered. *Positive* directions for management should never take place, till the three last years of the lease.

Such are the covenants which seem to me fair and liberal. They have been objected to, on opposite grounds, by landlords on the one hand, and by tenants on the other. My intention was, to suggest such covenants as might lay the foundation of an agreement likely to be advantageous to both parties ; and I trust, that those who may be inclined, in general, to adopt the stipulations above pointed out, will not be disappointed in the benefit that may be expected from them.

Before closing this important enquiry, it may not be improper to lay before the reader, such observations of a miscellaneous nature as have been transmitted to me on the subject of leases.

It has been remarked, regarding the restriction of selling hay, that as that article is never converted into dung like straw in the form of litter, there should be no restriction against selling it *. It is the interest of the tenant

* Feeding horses with hay, usually at 1s. per stone, is a very expensive plan for a farmer. He should certainly be allowed to sell it, therefore, whenever he can find a market. To feed horses for two or three months in the beginning of winter with straw, answers very well, and greatly diminishes the expence of their maintenance. Straw of peas and beans will even supply the place of hay through almost the whole season. There is little less manure made, because horses eat part of the straw ; and if the hay is otherwise consumed on the farm, by horses in spring, fattening

that his horses and cattle be well fed, and if there shall be any surplus of hay, he should be allowed to carry it to market. Grass, converted into hay, is not, like grain, of an exhausting nature, but is sown to meliorate the ground, and to enable the tenant to pay his rent. If a crop of hay, therefore, brings little money into the pocket of the tenant, and if one-sixth part of his farm must be in a bare fallow, how can he possibly stand in a manner the loss of two crops out of six? He may be tempted to risk a scanty crop of peas, or even a scourging crop of potatoes, imperfectly manured. In regard to the sale of hay, therefore, some latitude is necessary. This idea, however, is strongly objected to; and it is contended, that the farmer, upon a fair calculation, would make more by feeding his horses with the hay, which would make a great saving in the consumption of oats, than by sending the hay to the market, and bringing back dung. In all such cases, the farmer should make *exact calculations of expence and profit*; and above all, should never be induced to attempt any plan, by which the quantity of dung, (that great source of fertility), can be in any degree diminished. In this case, by feeding his horses with hay instead of straw, and littering them well with straw, a great quantity of manure would be obtained, at a cheaper rate, than by buying and carrying it from any distance.

Another correspondent observes, that in general he studies to have alternate green and corn crops, allowing such land as has been sown off with grass seeds, (which is

cattle, &c. there is no manure lost at all. To feed all the horses and cattle on hay, that the straw might all be used as litter, would be a very costly method, if it were even possible to provide as much hay as would serve straw-yard cattle, &c.

always done along with the first crop after fallow or turnips), to remain two or three or more years in pasture, according as the soil is more or less favourable to the growth of corn; yet when land is broken up from old ley, two corn crops are always taken. This practice, however, unless in very peculiar cases, cannot be approved of. General rules, at the same time, ought certainly to be modified by such circumstances as are often to be known only to real practitioners; and though the system of alternate green and corn crops, is beyond question an excellent rule in general, deviations from it must sometimes be admitted. In the instance above stated, the first crop of oats after grass is often uncertain, whilst the second is generally a good one; and the land, after two crops, is reduced to a finer tilth, for turnips or any other green crop *.

Another circumstance may also justify a deviation from the general rule that two white crops should never succeed each other. For instance, grass seeds are generally sown with the fallow crop, and it will, and does often happen, that the grass seeds fail. When that is the case, what can be done? there is the usual proportion of both green crop and fallow upon the farm. To compel the farmer, therefore, to put the land, where the grass seeds have failed, under a green crop, would often be very inconvenient. The usual plan is, to plough the field, where the grass seeds have failed, for another white crop, either

* It is also contended, that in remote parts of the country, where green crops are not so valuable as in the vicinity of large towns, two corn crops may be allowed, after the ground has been pastured for three or more years, provided that not more than one-half of the arable land is under a white crop at once, and that one-fourth of the farm, at the least, is under grass two years old. That system, however, cannot be recommended.

oats or barley, and to allow the grass field, that was intended to be ploughed up, to lie for another season.

In 1802, Mr Pringle of Ballencrieff, in East-Lothian, took a farm in Galloway, on a lease of thirty years, for the purpose of improvement; it was proposed to leave him at full liberty to manage and crop it in any manner he chose, for the first twenty years; but for the remaining ten, a rotation of crops was proposed, respecting the advantages of which he entertained considerable doubt. He observed, that it was most fair the proprietor should put it out of the tenant's power, to deteriorate the farm towards the expiration of the lease; but that it was absurd to prescribe a mode of management, and a rotation of crops, to be rigidly followed at so distant a period, as from twenty to thirty years from the commencement of the lease; that rotations, like most other things, have their day and fashion; that we think lightly of rotations, which were esteemed the best thirty years ago; that the political situation of the country might be changed, as well as the relative value of the different grains we cultivate, and that a better rotation of crops might yet be discovered than any hitherto known. He therefore suggested, that at the end of twenty years, the mode of cropping, during the remainder of the lease, should be fixed by arbitrators, mutually chosen by the parties, or by the sheriff of the county.

In general, it has been remarked, that the injudicious framing of leases, is of infinite loss to the agriculture of the country. No person ought to frame a lease, but one who thoroughly understands the business of farming. Were that the case, leases would be framed on such principles, as to enable the tenant to put his farm, in the beginning of his lease, in the best condition, and judicious restrictions would follow, at the end of the lease; so that

a farm, once put into good condition, would never be allowed afterwards to get out of it again. It is incalculable how much this would promote the farming interest; but by this not being attended to, many leases are so drawn up, as to put it out of a farmer's power ever to bring his farm into good condition; and at the end of the lease, the terms almost compel, or at least allow him, to leave it a complete ruin. In the county of East-Lothian itself, on an average, it may be safely maintained, that a year's rent is lost in the course of every lease, by the injudicious manner in which it is drawn up; and as there is little doubt, but that the rest of the kingdom labours under the same disadvantages, there is every reason to believe, that there is a loss of about five *per cent.* on the whole rental of the kingdom, which, if remedied, would be a saving to the country, more than all the grain required to be imported.

There is no point, however, that has been more strongly recommended, as likely to prove advantageous to the agricultural interests of the country, than to authorise the subletting of land. It is maintained, that until leases become disposeable property, the utmost value can never be obtained for an estate, because people who know how to make the most of their capital, hesitate, nay revolt, at the idea of investing their property, whence they cannot withdraw it, when they perceive another more advantageous mode of employing it. If a landlord entertains a partiality for a tenant, because he is a good cultivator, he may be almost certain that the subtenant, to whom the farm is sublet, is at least as good, if not a better one, because he must pay a higher rent. As the law now stands, there is an implied exclusion either to assign or sublet, unless a permission to that effect is expressly given in the body of the lease. It would be an endless task, it is said, to enumerate the baneful consequences of this system to

the community at large, as well as to the landholder. It may be fairly asked, Why make a freehold or seuhold estate assignable at the will of the possessor, and not a leasehold? Does it impair the landlord's security, or endanger his right of property? Quite the reverse. He obtains the security of two or more persons instead of one, and his farm is as likely to be improved, as the original conditions in regard to management cannot be broken through. The principal, as well as the substitute tenant, still remain liable as a co-obligant to the proprietor, and he will guard against the farm being injured or deteriorated by the person to whom it is devised, more especially if an extra or surplus rent is obtained. In fact, every new occupant or devisee, contracts upon the faith of improving more highly, and raising more produce, than his predecessor, by dint of additional capital, skill, and industry. Besides, there is a class of enterprising agriculturists, whose inclination is more bent upon active improvement, than confining themselves, for nineteen years, to one object or farm, and who, upon being suffered to reap the benefit of their capital so expended, through the medium of a subtenant or assignee, would assiduously persevere in the same system of improving the waste or less cultivated tracts of the country, or taking, from indigent, slothful, and ignorant occupiers of farms, land, to which they never could do justice. Thus a much greater quantity of capital, skill, and industry, would be brought into the field of agriculture; a greater quantity of human food produced; the face of the country enriched and embellished; and the interest of the landholder, as well as that of the community, essentially promoted.

It has likewise been urged, 1. That the present practice is a bar to the investment of capital, even by farmers themselves; 2. That no other class of the community will

embark capital upon such terms ; 5. That it excludes farmers from the assistance of credit ; and, 4. That it sinks the whole profession into a state of degradation.

With regard to the landlord, it is hardly possible to conceive, that his interest would suffer. • But the best proof that it will not, is, that when this liberty hath been granted, he actually has not suffered in the smallest degree. Subletting is a common practice in the west of Scotland, and many estates have been let with a right to sublet at the end of six years. Greater exertions have been made during this period, than perhaps can be shewn in any other part of the kingdom, and in some instances, the value of the land has been doubled in that time.

There is certainly much sound argument in these observations, (by many they will be considered as decisive and incontrovertible) ; and perhaps a system might be established, for promoting the improvement of this country, at least in its more remote provinces, in the same manner as the wilds of America are brought into cultivation. No sooner does the cultivator finish his task, than he disposes of his farm to another, and commences a new undertaking of a similar nature. In the same manner, persons possessed of capital, ardent minds, and a turn for agricultural improvement, with a power of subletting, under reasonable restrictions, might go from one farm to another, and thus be the means of bringing extensive tracts of country into a productive state *.

* Dr Skene Keith is of opinion, that the line of distinction between the cases, in which a farmer should be allowed to sublet his farm, or assign his lease, and that in which he should be prohibited from doing either, is the following : While a farm is under an improving lease, and a considerable proportion of it requires to be reclaimed from barren waste, drained, inclosed, and brought under a regular rotation of cropping, by bare fallow or

I have thus endeavoured to lay before the reader, the result of a very extensive correspondence, regarding the circumstances on which a liberal connection between a landlord and tenant principally depend. Their interests, when properly understood; are in general the same; and nothing can occasion any material difference between them, but a misconception of the principles on which the connection ought to subsist. When these principles are thoroughly explained, (to which I hope the preceding observations will in some degree contribute), the agriculture of the kingdom at large will derive advantages not easily to be calculated.

turnip husbandry, the landholder ought to have a *delectus personæ* of his tenant, who therefore should, *in hoc statu*, be prohibited from subletting or assigning his lease; but after the improvements are finished, these restrictions ought to cease, and wherever a jury found that a farmer had really improved his farm, he should be at liberty either to sublet it, or to dispose of his lease to another.

Some regulations are however necessary, where this liberty of subletting is permitted. Though landlords run little risk of loss, and are well secured by the right of hypothec, yet it might be thought right that they should not be obliged to deal solely with a stranger, or with a person whose character was exceptionable. The obligations of the original tenant, therefore, ought to remain binding upon him and his heirs; and he ought to be obliged to give the landlord three months notice, previous to the new tenant entering into possession of the farm, specifying the name, the place of residence, &c. of the new tenant, that if there is any just objection to him, it may be brought under the consideration of a court of law, by whom the propriety of entrusting him with the possession of the land may be determined.

DISSERTATION III.

OF THE VARIOUS DESCRIPTIONS OF PERSONS EMPLOYED IN
AGRICULTURAL LABOUR, IN THE MORE IMPROVED DISTRICTS
OF SCOTLAND.

THE individuals, by whom the agricultural labours of any district are carried on, consist of four descriptions of persons ; 1. Farmers ; 2. Farm-servants ; 3. Apprentices in Husbandry ; and, 4. Day-Labourers, or others occasionally employed in the cultivation of the soil. It is proposed to give some account of each of these classes, and to conclude with some observations on the advantages of carrying on the operations of a farm, under a regular system.

SECT. I.—*The Farmers.*

IN the year 1776, a learned and distinguished writer on agriculture, (the late Lord Kames), published a long article, “*On the Imperfection of Scotch Husbandry,*” which then was at a very low ebb * ; and in another part of that

* Gentleman Farmer, p. 383.

valuable work we find the following paragraph: "East-Lothian, time out of mind, has been famous for superior skill in agriculture; and yet to seek for instruction there, one would be greatly misled. That county, for the richness of its crops, is more indebted to the fertility of its soil, than to the skill of its farmers. What pity it is, that so fine a country, should be possessed by men so little grateful to Nature for her bounties * !". What a change has since taken place, for that very district has now become a pattern of improved cultivation. Indeed a zealous friend to agriculture, who has visited every part of the kingdom in search of useful information, (J. C. Curwen, Esq.), in his address to the Workington Society, in 1810, very candidly declares, "that the beauty and regularity of the crops, and the extreme cleanliness of the fallows, in East-Lothian, struck him more than any thing he had ever before beheld in any other country; that he does not know a farmer who may not learn something in that district; that in regard both to excellence of soil and management, it exceeded any thing he had ever witnessed in any other part of Great Britain; and though it costs him much to own it, that he despairs of being ever able to attain an equal degree of perfection."

So important an alteration, in so short a period as thirty-five years, must certainly, in a great measure, be attributed to the character of the farmers, who, not only in East-Lothian, but in the other more improved districts of Scotland, in respect of enterprise, information, and professional skill, are fully equal to those of any other country †. They have universally risen above the class of mere pe-

* Gentleman Farmer, p. 146.

† East-Lothian Report, p. 55.

sants; in knowledge, education, and manners, closely approaching to the character of country gentlemen *, and filling up the blank left by the extinction of the smaller proprietors.

The following observations will give some idea of the character of these farmers, and the qualifications they generally possess.

There is certainly no country in Europe, where the advantages of education are more generally diffused than in Scotland, and this is the case with the upper rank of farmers, fully as much as in regard to any other profession. Besides attending the grammar schools in their immediate neighbourhoods, and sometimes those in the more northern counties of England, their education is, in many instances, perfected at the universities of Scotland, where they acquire a taste for reading, which makes them masters, not only of agricultural information, but enables them afterwards to make a very respectable figure, whenever literary, or even scientific, subjects become the topics of conversation †.

Their mode of living varies. In the more northern districts, even where they are possessed of capital, they are distinguished for economy ; whereas, in the more southern counties, their mode of living unites at once, the comforts, and even the elegancies of life, suited to their station. They have also frequent and friendly intercourse with each other, both in their own families, and upon occasions, when their professional concerns call them from home, either for the purpose of marketing their grain, or purchasing and selling live stock ‡.

* Berwickshire Report, p. 118.

† East-Lothian Report, p. 56.

‡ East-Lothian Report, p. 55.

Their skill in husbandry is of a superior description, partly owing to the examples set before them by their predecessors, who were well acquainted with some of the most important branches of agriculture, though certainly deficient in others, and partly owing to their personally examining the husbandry of other districts ; but, above all, it may be attributed to their turn for reading, either books, or periodical publications on husbandry, from which they derive the earliest information of every new improvement.

Their attention to business is characteristic. One farmer informs me, that it is a rule with him to see his horses thoroughly cleaned every evening at eight o'clock. Another observes, how essential it is that the farmer should be commander-in-chief upon all occasions ; in particular, he ought to be the first up in the morning, to set all the wheels of the machine a-going, by his example and directions. Impressed with the necessity of observing that maxim, my correspondent informs me, that neither he, nor any individual in his house, has breakfasted by daylight, any time these nineteen years, *during winter*, (except by accident on any particular day). The breakfast is all over by candle-light, by which means an hour is saved, which many farmers lose by indolence ; yet six hours in a week, is nearly equal to the working part of a winter day. This is a greater object than can at first view be imagined, where there are perhaps twenty servants at daily work, or in that proportion.

Mr Kerr, in his Report of Berwickshire, has very ably described, that spirit of enterprise by which the farmers of Scotland are distinguished, which, though he has restricted his observations to Berwickshire, the county, the state of whose agriculture he was reporting, yet they are equally applicable to other districts. In the improved districts of

Scotland, the farmers are every where seen, carrying on extensive and costly improvement, by draining, inclosing, liming, and marling, or by careful and judicious improvements of their live stock, with all the eagerness and intelligence of commercial speculation. They trust to the profits of future years, to reimburse their large expenditures, with reasonable advantage. They are enabled to wait the result, in consequence of the sufficiency of their capital, and the security of their leases; the former derived from their own successful and intelligent industry, or that of their fathers; the latter, from the good sense of the landlords, in seeing their own interests most materially interwoven, in the security and success of their tenants.

Such is the anxiety entertained by the Scotch farmers, in regard to improvement, that many of them make annual excursions into the best cultivated districts of the united kingdom, where they have an opportunity of observing the practice of those districts, and comparing it with their own; and such is their candour and good sense upon these occasions, that though they may see much to censure, they neither withhold their approbation where it is due, nor are they backward in adopting the improvements of others, where they are likely to answer *.

Some have contended, that calculations and regular accounts, are not so common among the farmers of Scotland as they ought to be, and that other professions are, in that respect, much more attentive and correct. It would certainly be an important desideratum, to be possessed of a variety of calculations, adapted to various qualities of soil, and various rotations and modes of management. Practical men alone are qualified for such undertakings,

* East-Lothian Report, p. 55.

since every thing must depend upon accuracy and professional knowledge ; yet farmers, it must be admitted, do not, in general, take the trouble of keeping such minute and regular accounts as could be wished. At the same time, it is certain, that there is great difficulty in making calculations, or even presenting any thing like accurate accounts, applicable to all seasons, respecting the profit and loss of so uncertain a business as the one carried on by the farmer, which is regulated so much by the nature of the weather, the state of the markets, and other circumstances not under his controul. Still, a general outline is perfectly practicable ; and had not this been studied by a number of my intelligent correspondents, it would have been impossible for me, to have been furnished with so many authentic details, as have been given in the course of this work.

The principles on which their system of husbandry is established, depends on three important particulars ; 1. Economy ; 2. Simplicity ; and, 3. Arrangement.

Their economy is conspicuous, in their two-horse ploughs, their single-horse carts, their mode of feeding their horses, &c. The simplicity of their system appears, in their avoiding breeding stock as much as possible, but purchasing them when wanted * ; in their not cultivating too great

* This is at least the practice of East-Lothian, and is founded on the principle, that the division of labour is advantageous. It is proper, however, to observe, that on the best farms in Berwickshire, both sheep and cattle are bred. In Roxburghshire, sheep are universally bred upon arable farms, and cattle upon inferior lands. Whether fattening alone, or breeding and fattening, is most to be recommended, is a question that cannot be resolved without attention to a great variety of circumstances, and would lead to a long and intricate discussion. It is questioned by some, whether that inattention to live stock, and that constant

a variety of articles, and in their having all their instruments of as plain and simple a construction as possible. The arrangement of labour on their farms is also judicious, insomuch, that notwithstanding their living in an unfavourable climate, almost every day is well employed, and very few are lost. This is certainly greatly owing to the preference they give to married servants, who are more sober and steady, less inclined to remove, and, by their getting acquainted with the farmer's plan of working, every thing goes on like clock-work.

On the whole, the farmers, in the more improved districts of Scotland, are a most respectable and highly estimable body of men, and perhaps enjoy as great a share of that distinction and recompence, to which their skill, abilities; and capital, give them so just a title, as the

tillage, so prevalent in East-Lothian, is advantageous or otherwise. It is contended, that live stock, suited to arable land, in general, can be obtained in no other way, than by breeding them on the ground. Mountain sheep will not suit the fences, even if they were otherwise profitable, more especially upon turnip soils. There is a necessity, therefore, to breed the Leicester, or some other kind of sheep less lively than the mountaineers. It has been much disputed, whether it is more profitable to breed short-horned cattle, or purchase Highlanders. The profits of the latter are fluctuating, of the former more steady. It can be no otherwise determined, but by a reference to the circumstances of the farm. It is maintained, that if there should be any variety of cattle found or formed, with the properties of early maturity, in as eminent a degree as the Leicester sheep, it would be more profitable to breed them, even upon the best arable lands, than to purchase stock for fattening only. Mountain sheep, however, will be tame enough, when the folding system is introduced, which I have so strongly recommended; and in regard to cattle, where rents are low, and labour cheap, it has always been supposed, that lean stock could be most advantageously reared; nor are greasy sheep, and huge, coarse-grained bullocks, calculated for universal consumption.

same number of their brethren can boast of in any other country *.

SECT. II.—*Of Farm-Servants.*

IN all the improved counties of Scotland, a great proportion of the servants employed in husbandry are married, and rear up numerous families of healthy children. No sight can possibly be more gratifying to any individual, who can contemplate with pleasure the happiness of his fellow-creatures, than to see such colonies of hardy and industrious peasantry, as are to be found, on large farms, in the Carse of Gowrie, in East-Lothian, and in the counties of Berwick and of Roxburgh. I was thence led to pay particular attention to the state of farm-servants in those districts; the result of which I think it proper to lay before the reader, on account of its peculiar importance to a most valuable class of the community, though by some it may be considered as too diffuse, and entering too much into minutiae. The following detail is principally applicable to the counties of Berwick and Roxburgh, where the system of maintaining farm-servants is brought to the greatest possible degree of perfection †: at the same time,

* East-Lothian Report, p. 55.

† The account of the state of the farm-servants in the counties of Berwick and Roxburgh, is principally extracted from a most interesting communication on this particular subject, transmitted to me by Mr David Low: in regard to the other districts, the answers sent by several other intelligent correspondents, and the valuable Report of Berwickshire, drawn up by Mr Kerr, have been consulted.

observations regarding their state in other districts, when it is necessary, shall be frequently interspersed.

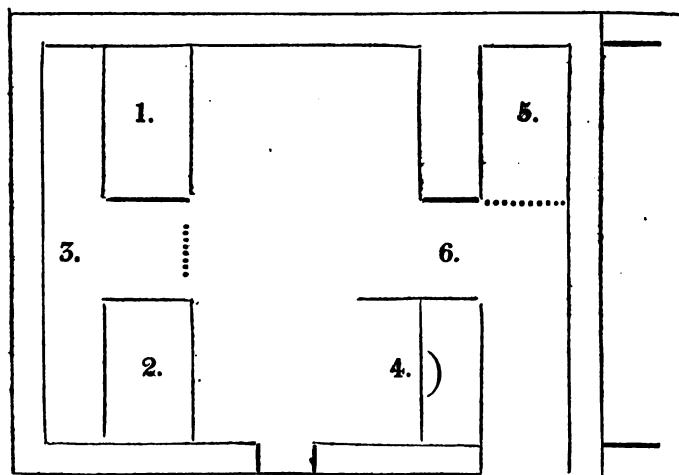
1. *Period of Hiring.*—Farm-servants in Scotland, when married, are usually hired for twelve months; but where young men are employed, it is the practice to hire them only for half a year. When hired for twelve months, it gives an idea of greater durability to the contract, in consequence of which they are led to continue for many years in the same service. Indeed, it is now a common practice in many counties, for the ploughmen who have families, when the wages are once fixed, not to think of any change, but to remain from year to year, unless any very unforeseen circumstance should occur, that might induce either the master or the servant to think of an alteration. It is the practice in some districts, to hire servants in the months of June or July, the year's service to commence at the Martinmas (25th November) following; whereas in other districts, they are not hired till Martinmas-day, and they go home the same day to service, which is thought a bad system, both for the farmer and the servant. In Berwickshire and Roxburghshire, married servants are hired at markets held in the month of March, for the Whitsunday following; hence, when a farmer enters at Martinmas, it is often difficult to get farm-servants worth the having.

— 2. *Place of Residence.*—Every *hind** or ploughman, has a separate house provided for him by his master. This he

* The word *hind* means a married ploughman, living in a cottage as a farm-servant; and the term *ploughman*, has a more general meaning, and may be applied, with propriety, to unmarried servants, living in their master's family, and working a plough.

furnishes himself, at an expence of from L.20 to L.30. These houses were formerly very indifferent hovels, but they are now built with stone, covered with pantiles, and sometimes with slate. The expence, at the present rate of labour, and price of materials, may be from L.30 to L.40 each, according to size, and distance from materials. Some cottages, however, have cost from L.50 to L.60. The following sketch will give an idea of the form or area of these houses, the position of the beds, and of the fire-place, which is usually placed in the partition of the wall.

Plan of a Cottage, on a small Scale.



- 1. } Beds.
- 2. }
- 3. Recess for holding milk, &c.
- 4. Fire-place.
- 5. Pig-sty and coal-house. (Should be the milk-closet).
- 6. Inner door.

In new cottages, better plans are adopted. They have two apartments, which are so necessary in time of sick-

mess, and on other accounts. The pig is supplied with a small separate tenement. The milk apartment is a small closet between the two rooms; and in other respects the accommodation is improved.

It would be highly expedient to have the houses of the farm-servants insured, as children are always fond of playing with fire; and it is well worth the attention of an enlightened and humane landlord, or of a farmer, who may have many married servants under him, to pay particular regard to their cleanliness and health. For that purpose, they should be induced, or bound, twice a-year, to have all their moveable furniture taken out, and carefully cleaned; and at one of these times, at least, to have the whole inside walls of the cottage white-washed with *lime*. For the sake of neatness, also, the outside might undergo the same operation. But for the inside, lime ought invariably to be used, as tending to destroy contagious effluvia; for, after sickness, the seeds of future diseases may still lurk in the bosom of the family. With the same view of destroying, once or twice a-year, the sources of contagion, no rags should be suffered to accumulate.

3. *Situation of the Houses.*—The houses of the farm-servants, originally formed a wing of the farm-offices; but they are now, where circumstances admit of it, always removed to a moderate distance *. On this plan, any temptation to commit petty depredations is done away, by the opportunities being diminished. It is also more cleanly and healthy,

* In some cases, there is a house at the farm-offices for the steward, or head servant, or for the *byreman*, who has the charge of the cattle; but, in general, an unmarried servant has a sleeping-room near the horses or cattle, to be at hand in case any accident should happen to them during the night.

and the hinds and their families are much less liable to agues, than when they lived in the neighbourhood of a moist dunghill. The children, too, are thus more easily kept out of the way of mischievous amusements, and, what is of more consequence, the farm-offices can be made more compact, and wholly devoted to their proper purposes. Besides, by removing these houses to a convenient distance, the risk of fire is avoided, which the proximity of many inhabited houses to the stack-yard, and farm-offices, would necessarily occasion, when the negligence or ineptitude of a farm-servant, or his wife, or a spark from their chimney, may occasion the destruction of a set of offices, with a crop recently harvested, and a stock of horses and cattle. Their cottages, however, should not be too far off, but at such a distance, (from 200 to 300 yards is reckoned the best), that the servants may always be within call, to attend to their stables, and various other duties.

4. *Hours of Working.*—The hours of working must vary in different places *, but in general are as follow :

* The following statement is given of the labour performed by the farm-servants, in the Carse of Gowrie, in Donaldson's account of that district. "The ploughmen get up in winter by the dawn of day, and are employed in the stable till nine o'clock, in feeding and cleaning, each his own pair of horses. After breakfast, the ploughs, or carts, are in employment for the remainder of the day, reserving only as much light as may suffice for repeating the operation of feeding and cleaning the horses. When the more busy season of the spring sets in, the plough is more diligently plied, being under yoke from nine to ten hours, with a short interval of an hour, about nine in the morning, and a similar rest about two o'clock. In the barley seed time, and during the summer and harvest months, the ploughmen get up by four in the morning; they are in the stable by five o'clock; and, unyoking about ten, are employed in cutting grass, and taking care of the horses, until two o'clock, when they again get under the yoke until seven at

In spring, the ploughmen rise at five o'clock; after dressing their horses, take breakfast, and yoke the plough about six; at eleven they come to feed and clean their horses, and after dinner yoke at two, and unyoke again at six.

During the harvest, they often rise at four, and begin work at five, or at light; breakfast in the field; unyoke at eleven; yoke again at two, and work till the evening.

When there is great pressure of harvest work, they will sometimes not unyoke at all; but the horses will be fed with corn in bags, while the carts are emptying in the stack yard, and whilst the men snatch a hasty refreshment.

In summer, they rise at half past four, and yoke at five. They unyoke after going five hours; they then bring in clover to their horses. In hot weather they rise at four, yoke immediately; unyoke at ten, when they bring in clover; again yoke at two, and unyoke at six.

In winter, they get up before day-light, yoke as early as they can see to work, and unyoke betwixt one and two o'clock. In the afternoon other jobs are executed *.

Female workers are out through the summer for ten hours,

night." In Roxburghshire, they never work less than ten hours, when the length of the day will admit, and in winter, from light to light. In harvest and hay time, and even when sewing the turnips, both men and horses work as much as they are able, without any regard to hours.

* On other farms, the common practice is, to yoke as soon as the men can see to turn a furrow, and to go on until they can see no longer. The man has some refreshment at 12, and his horses get some corn in the field beside him. They are out of the stable from eight in the morning to half past four in the evening, in the very shortest days. An hour's work of a man and a pair of horses, is considered to be worth almost a whole day's work of a man alone.

excepting at hay and corn harvest, when they work till sunset. In winter they work from six to eight hours, or from light to light.

But though these are the hours in general, yet in the busy period of harvest, or when there is a pressure of work, no limited hours of working are thought of. The servants are ready and willing at all times, by night or by day, to carry in and stack the corn, and perform every other necessary operation.

In regard to hours of working, Mr Church of Hitchill observes, that on a well-regulated farm, every person ought to work ten hours, as long as the days will admit of it, and from light to light, in the short days of winter, one half of the day before dinner, and one half after it. The work-horses also go two journeys or yokings in the day, excepting in the shortest days, when they are not unyoked, but have a feed in the field at noon, which prevents any loss of time in travelling to and from the stable. The plan of two yokings a-day, must be equally advantageous for them, as it is found for post horses, which can go thirty or forty miles in two stages, much better than in one. This does not seem to be understood in those parts of the united kingdom, where it is the practice to go but one yoking a-day, even in the longest days of summer. That practice probably originated in the common field system, and continues, owing to the distance of the land to be ploughed from the farm-offices; an additional proof of the importance of having the offices in a central situation.

5. *Wages in Money.*—The hinds in Roxburghshire and the neighbourhood, formerly received almost their whole wages or emoluments *in kind*, and, in order that they might provide themselves with clothing, they were allow-

ed to keep a certain number of sheep upon the farm. As that plan, however, could not well be continued, under an improved system, (in many cases, after the commons were inclosed, no sheep being kept by the farmer himself), it was converted into an annual allowance in money, known under the name of "*Sheep Silver*." This amounts, in different districts, to from thirty to fifty shillings, and in Roxburghshire it is on an average about L.3 *per annum*. To a servant of uncommon merit, it is sometimes raised to five pounds.

Servants of a higher description, who are entrusted with any charge of importance, have greater wages in money, sometimes as high as from twenty to twenty-four pounds *per annum* *.

6. *Wages in Grain*.—The payment of wages in kind, probably originated, partly from scarcity of specie, and partly from the desire of the servants to be provided with meal or grain, without going to market for purchasing these articles; and the farmers would most readily concur in the plan, as a market at home was thus given them for part of their grain, without their being put to the expence of its carriage to a distance, and as it gave the servant a kind of interest in what was going forward, without his being entitled to interfere in the operations carrying on. To interest them still more in the produce, it is a rule, that the grain given to the servants should be the best, next to the seed, that the farm produces, and dressed as completely

* Farm-servants have also a small perquisite in money, about one penny *per boll*, for driving grain to market, in addition to their regular money-wages. This allowance is not unreasonable, as the servants on such occasions are often twelve hours or more absent from their homes, and have often hard work as porters, in loading and unloading.

as possible. The payment of wages in kind, is almost universal in the more improved districts in Scotland, and contributes not a little to the sober and economical habits of the people, who might be tempted, if they had money in their pockets, to waste it at markets, or in ale-houses, instead of expending it on the maintenance of themselves and their families *. If paid in money, they are miserable and necessitous when the price of grain becomes high; whereas, when paid in kind, it is evident, that they suffer nothing in times of scarcity ; and, indeed, the higher the price of grain the better for them. This prevents a great deal of discontent in such times. On the other hand, it is asserted, that a large body of the community, thus feeling nothing of the pressure of want, are too apt to consume more food than they ought to do, and even to waste it. That, however, is not the case in Scotland. Their natural turn for economy, induces the farm-servants there;

* An intelligent farmer from Northumberland informs me, that some farmers in Tyne-side pay their servants in kind, or, which is the same thing, find them a certain quantity of corn, at a fixed price, but that is not a general practice; and two modes being followed, induces the servants to change their places, hiring to masters who find corn, when it is high, and changing to those who pay money alone, when corn is cheap. Were the Berwickshire plan general, it would be better, he observes, for both master and servant. The farmer would thus exchange the produce of the farm for the labour bestowed upon it, and the latter would not feel the effects of scarce years, and high prices. There is also another plan followed by some farmers, that of supplying the labourers with whatever corn they require, at a certain price per bushel, which is generally much below the average price. This is found to encourage prodigality, and sometimes induces the labourer to dispose of part of what he gets privately, when it is dear, and thus he becomes dishonest. It would be well for both parties were this plan abolished. For although the masters, who follow it, pay less money-wages than those who adopt the other plan, yet eventually their labour costs more.

to accumulate rather than to spend ; and they seldom consume more than is necessary for their subsistence. In years of scarcity, sober and intelligent servants, carefully economize at home, and sell the surplus, thus laying up a resource for old age and infirmity. The only objection I have heard to such a system is, that in years of scarcity, even the husbandman ought to consume less food, which may not be the case, when he has the same quantity allowed him every year. Nothing, however, but absolute famine itself, should stint the quantity of food to be consumed by the hard-working labourer. Indeed, when the price is high, he is tempted to diminish his consumption, more perhaps than he ought to do, for the sake of the price he can obtain for it.

Besides, the husbandman, as well as others in the lower ranks, *must* consume less food, in scarce, than in plentiful seasons ; for, though he gets the same bulk or measure of grain, where his wages are paid in that article, yet there will be less *meal* in it, which is the edible part of the grain. A scarcity indeed proceeds as much from bad quality, as from small quantity of produce, the one being a necessary consequence of the other, as skinny shrivelled grain produces food weak and unsubstantial.

The grain allowed to the hinds, in several districts, is to the following amount ; 72 Winchester bushels of oats, 18 of barley, and 8 of peas or beans, worth, on an average, about L.22.

It is contended, however, that the allowances to farm-servants should consist of meal, equal to the amount of their annual consumption, and not in unmanufactured grain ; and that both their wages and perquisites should as little as possible lead them to the sale of grain, or its use, (as is the case of keeping fowls), or on any other purpose but the maintenance of their families. If they have

a part of their wages paid in unmanufactured grain, which they may sell, it may be a cloak to dispose of what they have not honestly procured. Besides, as the master has much to do with the sale of corn, it would appear more in his line of business, to sell the produce, delivering to the servant the meal and barley required for his family, and paying in money the remainder of his wages, for buying what other necessaries may be wanted. This is not hinted at from any idea of a general disposition in married servants to pilfer, to which the use of the threshing-mill is a great check; but because poverty should never be led into the way of temptation. If no grain were paid in kind, it would be impossible to sell any without creating suspicion *.

7. Keeping a Cow.—Among the advantages enjoyed by farm-servants in the improved districts of Scotland, that of having a cow kept during the whole year, is reckoned a privilege of peculiar value.

In Roxburghshire, during six months in the year, the cow is in general pastured in a field, and during the remaining six months, is kept in the house upon straw.

* Mr Kerr remarks, in his Report of Berwickshire, p. 415, that a new custom is generally creeping in, of the hinds demanding money and meal, instead of grain. In some instances, £18 in money, and a weekly allowance of two pecks, or 17½ lbs. of meal, have been bargained for, instead of the articles, which may be denominated wages; all the other allowances or perquisites remaining as afterwards stated. This practice seems now again falling into disrepute. For two or three years the militia system had drained the country of men. But boys have since grown up to supply the demand, and men-servants are more upon their ordinary level. At that time they hardly knew what to ask, and a known good servant was never refused his demand.

About calving time, in some districts, she has a regular allowance of coarse hay, or turnips, or something equivalent. The cow, and her produce, is the servant's property. The milk itself forms no small means of support to the family, and, in particular, tends much to the comfortable subsistence of the children. The cheese is mostly consumed at home. Any quantity of butter, that is not used for necessary domestic purposes, is sold, in small quantities, at the weekly markets, in a fresh state, or is salted, and sold at the market price, whatever that may be, usually about 50s. per firkin. Good housewives generally strive to have at least one firkin for sale; and sometimes as many as three. The whey is generally given to the pig. The value of the cow to the cottager depends very much on the pasture on which she may be placed. It varies from L.6 to L.10, and, in very favourable situations, will amount to a still greater sum. Indeed, a good cow, properly maintained, will produce at the rate of 1s. per day, or L.18 *per annum*. The calf they sell as soon as possible, being rarely allowed to keep one on the farm, and never on valuable land. When the calf comes in winter, they usually fatten it to the value of L.5, and even upwards, in six or eight weeks. It is kept in the house, and the master has no reason to object, however long it may be fed in that manner.

The benefit of milk to a poor family, is of such peculiar importance, (producing double the quantity of human sustenance it would do, if the milk were converted into cheese), that the practice cannot be too much recommended. An intelligent farmer informs me, that his servants had been frequently offered L.10 *per annum* in lieu of a cow's maintenance, which they have repeatedly refused. Keeping cows is certainly attended with some inconveniences to the farmer, and, occasionally, disputes will arise between the

servant and him on that subject ; but it is such an advantage to a person with a family, to be able to provide his children with milk, that it would be a misfortune were such a system to be altered, where it is already established ; and indeed I hope, that, in process of time, it will be introduced into other districts, where it may be at present unknown.

The idea of giving turnips to the servants cows, is considered by some to be unreasonable * ; but upon turnip farms, in the counties of Berwick and Roxburgh, and in other districts, it has become so common to give a moderate quantity, that it is almost considered to be a right ; and indeed without it, the ploughman and his family cannot be supplied with milk in the winter season. It has become usual, therefore, when the cattle of the farmer get their turnips in the field, that the ploughman's cow shall go along with them, or they receive six cart-loads of turnips for each cow. In other farms, they give two cart-loads of bog-hay, or one cart-load of good clover and rye-grass hay per cow, in place of turnips. They ought always to be allowed either hay or turnips for a part of the winter.

As the best mode of preventing disputes regarding the feeding of cows, it is the practice with some farmers, to furnish the cow themselves, and if she gets fat, to sell her,

* Upon all well-improved farms, where the crops are strong and free from grass, it is absolutely necessary to give the servants cows some better food than the straw. Formerly the straw was better, owing to defective husbandry, being generally mixed with some grass produced naturally with the grain crops. But now, if the hinds cows had not better food, when near calving, than mere straw, they would often be lost altogether, or would become so low in condition, before they got grass, that they would be of very little value to the owner during the summer months.

and to provide another in her place. This plan is convenient for young people who get married without much stock. But it is one of the principal recommendations of this method of paying married servants, that if their cow is well kept, it is a powerful inducement for them to be steady and correct in their behaviour, and this would be greatly diminished, if the cow was not their own absolute property.

In the case of unmarried servants, an agreement is sometimes made, in the more northern districts, to supply them with a certain quantity of milk, of which even the ploughmen in Scotland are fond, not being much accustomed to beer. The quantity usually given, is about a Scotch pint, or two English quarts *per day*; but some give it only during the summer months. Mr Thomson in Muirtown of Balhousie, near Perth, calculates the expence of a Scotch pint of milk *per day*, at 4d. and consequently in all, at L.6 : 1 : 4 *per annum*. In Strathearn, this allowance is converted, at the rate of 52s. *per annum*. Instead of giving any specific quantity of milk, Mr Rennie of Kinblethmont keeps a cow for two or three of his unmarried servants, according to her size, and divides among them the milk she produces.

8. Pigs.—Farm-servants are seldom precluded from keeping a pig, which can be fed on the refuse of their potatoe crop, with little additional expence. That indulgence is certainly of much consequence to them, and, when the animal is confined, of very small consideration indeed to the master. The flesh used to be regarded in Scotland with Jewish antipathy, but such prejudices are now got the better of, and the unclean beast is slaughtered without repugnance. The pork is salted, and used by the family in small portions at a time. It makes a good relish to

their vegetable diet, and serves to render their barley broth more palatable. When fattened, a pig of the ordinary sort may be worth from 30s. to 40s.; but those of a larger size may sell for L.3, or even L.4, or guineas. When fat, the pig may weigh about 9 stone, of 14lb. each, at 4d. *per pound*; this would amount to 42s. besides the lard and in-meat, from which, however, the original cost of the pig, at six weeks old, about 10s. must be deducted. Some industrious farm-servants in Berwickshire will feed two pigs in the year, as young pork is much used in that county.

Some farmers are apprehensive that the pig is fed on oats or potatoes not very fairly got; they prefer, therefore, giving them six English stones of pork, instead of allowing a pig to be kept.

9. *Poultry*.—I was often astonished, at the almost incredible number of eggs, shipped at Berwick for the London market, amounting in value to several thousand pounds *per annum*; but the number of fowls kept by the farm-servants, not only in Berwickshire, but in the neighbouring districts of Northumberland, and Roxburgh, (the surplus eggs of which are shipped at Berwick), and some even from East-Lothian, Tweeddale, &c. fully explains it. Every ploughman is allowed to have from three to five hens, (a cock and six hens is not an unusual allowance), and the country abounds with travelling hawkers, who collect the eggs at from 6d. to 1s. *per dozen*, sometimes as high as 20d. and, about Christmas, even 2s.; they also purchase any hens or chickens that are not sold at the weekly markets in the neighbourhood. The farmers, afraid of having their grain embezzled, are anxious to commute this perquisite for a payment in money, of from five to ten shillings *per annum*, to which the hinds are sometimes obliged to assent, but

with a degree of reluctance, which shews the high idea they entertain of the profit to be derived from this privilege.

10. *Garden.*—To every cottage, there is generally attached a small garden, in which they cultivate onions, cabbages, early potatoes, &c. This is of great benefit to the servant, but is sometimes a loss to the farmer, from the dung it requires, which is allowed on particular occasions, not as a matter of right, but at the servant's request. The ashes from his cottage, and the dung of his pig, &c. are commonly sufficient.

11. *Potatoe Ground.*—In Berwickshire, every ploughman is allowed as much ground as will plant from one and a half, to three bushels of potatoes. In East-Lothian, the allowance of ground given for planting potatoes is about one-tenth part of an acre, or nearly 100 yards, upon a six-ell ridge about $19\frac{1}{2}$ feet broad, or 900 yards of a drill in length. On an average, two firlots, or three bushels of potatoes, may be planted on 600 yards of a drill, $2\frac{1}{2}$ feet wide, where a ridge is 15 feet wide, by 100 long. Dung is furnished to the potatoe crop by the farmer; the horse culture is done by the farm horses, and the hand culture by the wife and children of the servant. The importance of this privilege is too obvious to be insisted on. This mild and wholesome root, is a prime article of food to the industrious peasant, and to his children in particular.

12. *Flax.*—In Berwickshire, each hind has the privilege of sowing about a peck of lint-seed. In East-Lothian, one-tenth part of a Scotch acre is allowed for that purpose. This plan is said to be highly advantageous, as its culture, dressing, spinning, and preparation for the manufacturer,

affords a useful source of industry to the wives and daughters of the hinds, and they are thus also enabled to provide themselves with linen, and sometimes to sell a small quantity of cloth.

Others view this privilege in a very different light. They contend, 1. That when farm-servants are allowed to sow a portion of flax, their houses, which are often thatched, are very liable to be set on fire, from the flax being kept near the roof ; and one farmer, it is said, has had his whole farm cottages twice burned down, within the space of a few years, owing to that circumstance ; and, 2. That the manufacturing the flax, and the spinning it afterwards, prevents the young girls from getting out to assist the farmer in his operations, so much, and so often, as occasion may require ; whereas, nothing tends so much to encourage the breeding of healthy rustics, as the girls working out of doors, at all kinds of agricultural labour, suited to their strength and sex. This objection, however, is not well founded, the flax being spun in the winter months, when out-door employment cannot be procured.

The culture of flax by farm-servants has certainly much diminished in Berwickshire ; and the farm-servants now, generally take land for potatoes in its stead, in addition to their ordinary allowance of ground for that root. This may be owing to various causes. 1. The crop is very unproductive in dry soils ; 2. There are few flax-mills, and the dressing by hand is extremely troublesome ; and, 3. Spinning is a miserable employment, and not so profitable, as the more pleasant and healthy work that can be had out of doors.

13. *Bees.*—The keeping of bees is never prohibited, but the cottagers wives and daughters find more profitable employment in their household, and other duties, than in

attending to this precarious and wandering stock. The correct modern husbandry of Scotland, has deprived bees, of that variety of food these insects formerly enjoyed, from the numberless wild flowers or weeds, both annual and perennial, which the drill and fallow systems have almost extirpated. The bloom of furz, (whins), from which they extracted a substance, either for making honey, or constructing their cells, is now more rarely to be met with; these plants being almost rooted out in the more improved districts. At an average, under the most favourable circumstances, a hive may produce three Scotch pints of honey, worth from 5s. to 7s. a pint; but in bad seasons, the quantity is very inconsiderable. Some question, whether the honey ever repays the owners for the time spent in watching, and hunting after this capricious stock, often to the distance of miles, and losing them after all, and this risk is certainly alone equal to a considerable per-cent-age on the capital invested in it. At the same time, it is a pity, in favourable situations, not to keep up a spirit of attention to the labours of this industrious insect, the total produce of which, in an extensive district, would not be immaterial.

14. *Fuel.*—Where coals are difficult to be procured, and where peats and turf abound, these, no doubt, are preferred; but in situations where the farmers consent to carry the coals, and where the supply of peats and turf is scanty, coals are used in preference. Peat and turf, when good of their kind, give a greater blaze, and diffuse warmth with a cheerful light; but they consume too quickly, and afford a less steady heat for the operations of cookery than coals. Their ashes, also, are apt to be blown into every corner of the house. Where coals are used, each hind has from three to five single-horse cart-loads, carried home

to him, but the price, and the tolls, are usually paid by himself. In Roxburghshire, never less than four double-horse carts of coals are allowed, and indeed often as many as they choose to pay for at the coal-pit. This latter alternative ought never to be denied, and will not be abused. The master ought always to carry what a poor servant may find it necessary to pay for. The quantity required must depend upon the size of the family, health or sickness, and the severity of the winter.

The following statement, communicated to me by Dr Young of Fawsyde, near Stonehaven, points out the superiority of coal over peat as fuel. A poor woman was obliged to purchase peats, during a scarcity of coals in winter; her daily consumption of peats cost her three half-pence; her annual quantity of coals was two bolls, each boll 36 stone Amsterdam weight, or containing about 212 pints. Coals generally sell at Stonehaven for about 5s. per boll; the highest they have been known at was 6s. 8d. Her peat fire, (although at the common price of coals, more than four times their value), was not nearly so serviceable.

15. *Perquisites*.—In addition to these allowances, and some perquisites when driving grain, lime, marle, &c. where the carriage is distant, the farm-servants, during harvest, and when carrying in corn, have their maintenance, because their wives are then employed in the service of the farmer, and also because of the extra hours in which they are employed in that busy season; but they are not allowed those quantities of beer, which occasion such an endless expence in the houses of the farmers in England, without being of any real advantage to the servants themselves. During harvest, they are only allowed in Berwickshire a sort of table-beer, between ale and small beer, called *harvest-beer*, being made for that season. Of this liquor

they have a chopin, or quart, and eighteen ounces of wheat-en bread, for breakfast, dinner, and supper, in the same manner as the reapers *. When they work *extra* hours, they receive an addition accordingly. In many cases, they are only allowed victuals during the time of *reaping*, but not when carrying; in others, they have a month's victuals, whatever may be the time required for reaping and carry-ing. In regard to perquisites in general, it has been justly remarked, that they should be considered as premiums for good behaviour, and not as a matter of right. Indeed, Mr Walker of Mellendean allows only such of his servants, as distinguish themselves by their good behaviour, to keep a pig.

15. General View of their Wages and other Emoluments.

Wages.

1. Allowance in money, on an average about	L.4	0	0
2. Value of the allowances in grain,	22	0	0
<hr/>			L.26 0 0

Perquisites.

3. Keep of a cow at 6d. per day for the whole year,	L.9	2	6
<hr/>			

Carried forward, L.9 2 6

* An intelligent correspondent informs me, that in his part of Berwickshire, the ploughmen are allowed breakfast, dinner, and supper, while employed in the hay, as well as the corn harvest; and that the same allowance is given them, while their wives, &c. are employed in reaping the crop, though they themselves may be engaged at the plough, or other ordinary farm labour at that time; as their wives cannot in that case cook their victuals.

Brought forward,	L	9	2	6	L	26	0	0
4. Poultry,		0	10	0				
5. Garden, and land for potatoes and flax,		3	10	0				
6. Carriage of coals,		1	10	0				
7. Harvest food, and allowance when leading,		1	0	0				
					15	12	6	
								* L.41 12 6

In the above statement, the land for the garden, and of the potatoes and flax, is only estimated at its worth to the farmer; but it is more valuable to the hind, from the articles it produces.

17. *Family Gains and Perquisites.*—In addition to the above sum, the families of the farm-servants enjoy various sources of profit. Their wives, and their children, from the moment they can handle a hoe or weed-hook, except in the dead of winter, are never in want of *out-work*, for which they receive ample wages. In fact, a ploughman's family, after the first few years of helpless infancy are over, are his riches, and they often contribute to maintain him when he is past labour. Beside the out-door work, there is also a good deal of industry *within doors*. Spinning forms a considerable part of the employment of the females; they make also their own clothes, and repair those of the men; they knit stockings, the wool of which they themselves card, spin, dye, and twine. These, with the other house-

* This *per week* is 16s. or 2s. 3½d. *per day*. The average of all England in 1810 was 2s. 5d. Mr Curwen pays only 15s. *per week*, wet and dry.

hold cares of baking, cooking, washing, churning, cheese-making, &c. furnish ample employment to an industrious family circle. Their diet is indeed plain and simple; but it is wholesome and nutritive. They have abundance of milk, meal, and potatoes for food, and the savings of the produce of their cow, their lint, their money-wages, and a portion of the meal which they save, serve to procure to them and their families decent and comfortable clothing *.

On the whole, the following is the income which, in some cases, a hind, with an industrious family, may acquire :

1. Gains by the ploughman himself,	L.41	12	6
2. His wife's harvest food, 28 days, at 10d.	L.1	3	4
3. One child working at turnips, &c. at 8d.	4	0	0
4. Gains of his wife and children in barn-work, and spinning, through the winter,	2	7	6
	—	—	—
	7	10	10
	—	—	—
	L.49	3	4

Some profit is also derived from the garden, the potatoe ground, and from the flax sown. The rent of the

* Mr Kerr observes, that a sober and industrious labourer or ploughman, is as happy a being as any on the face of the earth. He has abundance of food and clothing, his time is fully occupied, and if he has a good wife, and a thriving family, there is nothing to distress him.

'cottage also, is frequently paid for by the wife's working during the harvest.

The gains of a family, particularly on turnip farms, are sometimes even higher, and a correspondent informs me, that he has often paid the following sums to the branches of one family :

1. Hind's wages, as above,	L.41	12	6
2. The wife, at 1s. per day, for one month,	1	8	0
3. A daughter, at 3s. 6d. for 24 days,	4	4	0
4. Ditto, for four Sundays, at 1s. per day, for victuals merely,	0	4	0
5. A daughter and a boy, from March to Sep- tember, at 1s. per day, for 16 weeks, or 12s. per week,	9	12	0
6. The wife, occasionally during that time,	2	8	0
7. In winter, three days a-week of the daugh- ter and son, from October to March, on an average, eight weeks, at 12s.	4	16	0
	<hr/>		
	L.64		
	4		
	6		

Independent of spinning, and other household work.

It is evidently, therefore, not only a great advantage to the farmer, to have married servants; but the unmarried servants may thence be satisfied, that it will be in their power to maintain a family, if they are industrious.

Such is the general state of ploughmen, or *hinds*, as they are provincially called, in the counties of Berwick and Roxburgh. A few words will explain their situation in other districts.

In East-Lothian, Mr Brown of Markle gives the following account of the wages he pays to no less a number than 14 married servants. They are all paid in kind, having

12 bolls, or **72** bushels of oats, **3** bolls, or **18** bushels barley, and two bolls, or **8** bushels peas *per annum*, together with maintenance of a cow, summer and winter, a piece of land for potatoes, generally worth L.1, 10s., a piece of land for flax, generally worth **20s.**, liberty to keep a few hens, what dung is wanted for their gardens, coals driven, and their whole maintenance during harvest, (which usually lasts for about five weeks), and if they do not receive their supper in kind, they are paid for it in money. The servants who sow the corn receive, beside the above articles, a pair of shoes, or **9s.** in lieu of them, and those who stack the grain, have half a bell of wheat on that account. Taking every thing at a fair value, the wages and emoluments of each servant, where the cow is well maintained, may be calculated, according to the rate of markets in 1810, at L.**38** sterling, *per annum*.

In Dumfries-shire, Mr Stewart of Hillside gives the following estimate of the expence of keeping a married farm-servant:

A cow kept, or her milk furnished, the calf, at a month, being the farmer's, for the waste, and risk of the cow*,	L.6 0 0
52 stones of meal, at 2s. 6d.	6 10 0
Potatoes, from 3 to 5 cart-loads, according to the number of children,	2 0 0
House and firing,	2 10 0
Money-wages,	15 0 0
	<hr/>
	L.32 0 0

* Some farmers stipulate to get the calf, for **50s.** or **60s.** at three months old, or when weaned; but this may occasion disputes. It is much better for the master, if he wishes for the servant's calf, to purchase it at the market price.

Servants who have not a cow's milk, get a Scotch pint, (2 English quarts), of skimmed-milk daily, for nine months, which may be reckoned worth 30s. This will bring the wages to L.28, 10s.

Mr Boyd, of Powis, near Stirling, estimates the expence of a married servant at L.32 : Mr Blair of Montague, near Perth, at L.31 sterling.

In the Mearns, the following is the calculated expence:

In money, yearly,	L.10	10	0
In coals,	1	1	0
In potatoe ground,	0	15	0
In meal, 6½ bolls, at L.1, 4s.,	7	16	0
A cow, kept summer and winter,	5	0	0
	<hr/>		
	L.25	2	0

In Caithness, a married man receives L.8 of money-wages, and seven bolls of meal, which is calculated to be worth, on an average, 20s. per boll, with the keep of a cow, which being but small in size, and perhaps but indifferently kept, consequently cannot be estimated at more than L.3 additional, and a house and fuel, worth about L.3 more, consequently the whole will not exceed L.21.

Thus it appears, that the wages of servants diminish as we proceed northwards. The additional expence, however, of farm-servants, in the more southern districts, is, in general, amply compensated, by the additional skill and industry of those who receive it.

18. Married Servants.—It is here proper to discuss the important question, whether single or married farm-servants ought to be preferred, and to lay before the reader

the evidence of several intelligent practical farmers, in support of the married system.

Mr Stewart of Hillside remarks, that married servants are generally more steady than the unmarried, and also more docile, feeling that they cannot so easily move themselves from one place to another; and if thrown out of work for a very short time, that they have more than themselves to provide for, having in general a numerous and clamorous progeny. This system is useful in various respects. If the master is solicitous about their welfare, by attention to their wants and necessities, they are inclined to continue with him, and at length a mutual attachment springs up between the master and the servant; the servant is thus induced to attend to the manner of performing his work, so as to promote the interest of the farmer, (which rarely enters into the views of unmarried servants), and even to exceed the mere performance of the duty required of him. Besides this the horses will be better cared for, will do their work more easily, and their lives will be considerably prolonged, by keeping the same persons long about them, so as to have become acquainted with their tempers, instead of changing every half year*. There ought to be, however, one unmarried servant, who can be depended upon, to be near the horses, in case of accidents during the night.

Mr Dudgeon of Primrose Hill states, that the necessity of furnishing a house, and purchasing a cow, before they can propose entering into a married state, holds out a strong incentive to early habits of sobriety and frugality,

* It is a great public disadvantage attending small farms, that the servants must be unmarried, as the small farmer cannot afford accommodation to married servants.

and lays the foundation of that decency of character in after life, for which the individuals of this class (in Scotland) are so justly distinguished *.

In a communication from Mr Jack of Moncur, in the Carse of Gowrie, the advantages of having married servants are ably stated. It is there observed, that they do not remove so often, which is a great benefit; that they get acquainted with the farmer's plans of working; and that their families are useful in harvest, and among drill crops, both of which are done by piece-work. Indeed, within these eight or ten years past, the harvest work, which was formerly performed by people from Athol, is now executed, in that district, by the inhabitants, and a great deal of it by women and children.

Mr Ballingall, in Fifeshire, also prefers married servants, as being more steady and industrious, as well as sober, and always at home; and as their families furnish abundance of turnip hoers, who are inured to work from the time they are able to lift a hoe.

Mr Thomson of Bewlie, in Roxburghshire, is likewise strongly prepossessed in favour of married servants. He observes, that large farms have a tendency to increase population, *as it is almost impossible to farm them to advantage without married servants*; such servants are not only the best, but their children are in general numerous, strong, and healthy.

Mr Walker of Wooden gives a decided preference to married over unmarried servants, both in respect to cheapness and attention to business. The unmarried servants, receiving high wages in money, and plentifully fed in their masters' kitchens, have nothing to care for, and of course

* This is a strong argument against the system of the masters providing cows.

have no incitements to habits of economy. They are consequently apt to spend their money on foolish and extravagant articles of dress, and sometimes in a less harmless way at the ale-house ; while the married servant uniformly returns from his work to his own peaceful family, and contentedly shares in their homely, but wholesome meal.

Mr Blair of Montague, near Perth, calculates the expense of a married servant, at L.31, 11s., and of an unmarried servant at L.33, making the former the cheapest.

Some farmers object to married servants, as troublesome about their cows and houses*, and as being disposed to pilfer, for the sake of their cows and families ; but from the observations above detailed, the superiority of married servants can hardly be questioned, and they seem indeed to be almost indispensable for large farms. Their utility also in training up such numbers of young persons, to the labours, and to the art of husbandry, cannot be too highly appreciated.

In regard to the public, it has been well observed, that married servants not only are the best for the farmer, but add strength to the state ; and indeed it is of such consequence to have a healthy and numerous agricultural population, that it might be politic to give, by way of premium, to those farmers whose ploughmen were married, a deduc-

* As to being troublesome about the cows and the offices, it should be noticed, that the cows should have a separate house near their cottages, the doors always unlocked, that the master, or his confidential servant, may see what is going on. They ought not to stand in the cow-house with the master's cows, which occasions the wives and children to make perpetual errands to the offices. Indeed, when they are fed together, it is scarcely possible to avoid giving the servants' cows, whatever is given to the master's, which is not to be expected.

tion of the horse tax, as a mark of public approbation of so advantageous a system.

In many of the returns transmitted to me, the ploughmen are all married, in others only two or three on a farm are in the single state ; but, on an average, ten out of twelve, or five-sixths, are married, forming little colonies, of a description of persons in the highest degree useful and meritorious ; decent and orderly in their behaviour, and deserving every possible degree of encouragement.

Though it may be attended with some disadvantages, yet, on the whole, it greatly contributes to the comfort of the farmer, to have his servants married. Their victuals are prepared in their own houses, and there is no grumbling, either regarding the quantity or the quality of their food ;—a source of endless complaint where a contrary system is adopted *.

In regard to unmarried servants, most farmers keep one or two lads who live in the house, and who each work a pair of horses. Their wages vary, from L.5 or L.6, up to L.12 half yearly, (the term for which they are engaged), and they have their full board in the farmer's kitchen. As soon as they earn a sufficient sum to furnish a house, and purchase a cow, they generally get into the married state.

19. *Average Number of Children.*—The hinds do not mar-

* It is well known, that farm-servants, when kept in a house, are extremely troublesome about their victuals ; indeed, such is the perverse nature of mankind in general, that the better they are treated, the sazier they are apt to become, and the more disposed to grumble. Nor is it possible to estimate the expence of keeping an unmarried servant in the master's house, as it depends upon the extent of his appetite, as well as the mode of feeding. Some unmarried servants, however, are necessary, to be trained up to ploughing, and other agricultural operations.

ry until they have accumulated some capital, to enable them to purchase furniture, a cow, a pig, &c. Some contend, that the average of a hind's family may be stated at five children ; others, however, consider that estimate to be too low ; for in several cases they rear from seven to eight, and even nine children.

*20. Whether the Children are educated ?—*Any neglect in so essential a duty as that of educating their children, is held to be so scandalous, that hardly an instance of it is known. Boys and girls are invariably taught to read; and, before their leaving school, their Bible is made perfectly familiar to them. A thorough knowledge of their catechism is also reckoned indispensable. They are generally taught to write a little, especially the boys, and sometimes to cast accounts ; and this most commendable attention to the education of their children, seems to gather strength, with the more efficient circumstances of their parents.

*21. What becomes of their Families ?—*Most commonly, at least one lad in a family, remains in the humble calling of his father ; but the greater proportion of them betake themselves to different trades ; for the successful prosecution of which, they are in general well fitted by early habits of frugality and industry. A few become soldiers ; a number are compelled by ballot to serve in the militia, or more commonly their own, or the hard earnings of their friends, are wrung from them, to provide substitutes, when the lot falls upon them. The sea being generally regarded by them with horror and aversion, the navy derives little, or no advantage from this source.

The females seldom get into the state of matrimony until they have fully attained the years of discretion ; the phlegm or prudence of their country gallants, seldom fa-

vouring very early matches. Before this important era in their life, they are employed in the manner already described, or enter into service, in the houses of the neighbouring gentry and farmers.

22. *What becomes of the Hinds in their old Age?*—Many hinds who have brought up large families, have, in their old age, a pretty considerable sum remaining. It is not unusual for a careful husband and wife, to save £10 yearly, if the family are all healthy. It is common for an unmarried son “*to take the hindring.*” as they term it, when his parents are old, and let the old people live along with him, and do what little work they can. The fathers sometimes takes care of the cattle, work at hedges, or with the spade, &c. and from their habitual temperance, and the regular pursuits of their youth, they are usually capable of earning a scanty subsistence, as day-labourers, or otherwise, until the very verge of old age. When absolutely unfitted for labour, by infirmity, or extreme old age, they are maintained by their children, or by the parish poor-rates; which last, unfortunately, begin to supersede the former mode of support; for within the memory of many, the disgrace of permitting an aged parent, or near relation, to be beholden for his subsistence to this legal sort of beggary, would have stimulated the most profligate to industry.

23. *Their manners and Character?*—The manners of this class of people accord to their situation in life, being simple, orderly, and decent. They live contented, happy, and independent, and rear large families of healthy and hardy children, to support them in their old age, and to follow them in their industrious habits.

Though they labour incessantly during six days of the

week, Sunday is to them a real day of rest, and distinguished by a peculiar attention to religious ordinances, and to the instruction of their children in the duties they have to perform. The Scotch farm-servants are fully as extravagant in the articles of clothing, if not more so, than the English. They have all their Sunday's garb, and rarely attend church, on that day, in their common dress.

24. What would improve the situation of the peasantry?—Owing to the numerous families which they generally rear, it is seldom possible for them to accumulate any capital, as a provision for their old age; but there is no doubt, that they could easily afford small weekly payments, that would be sufficient to secure them a comfortable and independent subsistence when advanced in life. Nothing therefore is wanted, to complete the comfortable situation of this most deserving class of the community, but the institution of Benefit Societies; and the person who would establish a safe and practicable plan for that purpose, would prove of infinite service to them and to the public*.

25. Objections to the above System considered.—It must not be imagined, however, that this system has not been

* Some are of opinion, that the belonging to a Benefit Society, ought to be legislatively rendered compulsory on every individual in the empire above fourteen years of age, and under forty. The destructive poor-rates must take care of the older till they die out. Every parish ought to assist the funds at the outset, for a few years, till well established, which will be an enormous eventual saving. The establishment of Benefit Societies universally, upon a broad and judicious basis, would immortalize any minister who carried it into effect.

objected to ; but the objections urged do not seem to be material. It has been said, that it would be much better to lay down at the ploughmen's doors a certain quantity of potatoes, than to give them the trouble of raising them by their own labour ; and to furnish them with milk, instead of permitting them to keep a cow. These privileges, it is admitted, are attended with some inconveniences. Their potatoe land may not be so completely worked up as that belonging to the farmer ; and the servant's family may not always be in a state to pay sufficient attention to the cow, who may suffer by their neglect : But the great object is, to make farm-servants and their families industrious, economical, and, above all, happy ; and to interest them in the prosperity of their master, and the welfare of their country. All this is best effected, by giving them the possession of *property*, in the preservation and advantages of which they must feel themselves deeply interested. I have no doubt, indeed, that if the farm-servants in England were put upon the same footing with those above described, it would be a great blessing to the country. The Scotch farmer can at all times have the command of his farm-servants ; and when he wants any thing done, he knows where to find them immediately, as they are all living on the premises, with their families, in their own houses. But the English farmer, on the other hand, must go a mile or two off, or more, to find his people ; and, perhaps, must go from pot-house to pot-house, before he can get them ; and then in a situation unfit for labour, which not only disappoints their employer, but such a way of expending their earning, beggars their families, and compels them to apply to the parish for relief *. This is one

* Hence the advantage of paying wages in kind, as has been already remarked. When they have but little money in their possession, they are not tempted to go to the alehouse.

great cause of the heavy poor-rates all over the kingdom. Nothing would tend more to diminish those rates, and to reform the morals of the lower classes, than for the proprietors of landed property in England, to build, on every farm, a sufficient number of cottages, for the residence of farm-servants and their families, with small gardens attached to each. The farmer would thus, at all times, have the command of his servants; and it would be the means of keeping them out of public-houses. It would not then be necessary to send for them in a morning to go out with their horses, which is too often the case at present, by means of which a great deal of time is lost, not only of the labour of the men, but of the horses.

26. *Other Farm-servants.*—Besides the ploughmen, to whom the preceding observations principally apply, a variety of other servants are essential on large farms, as shepherds, smiths, carpenters, and persons to do other kinds of husbandry work, unconnected with horse-labour. These are necessary under an improved system, independent of day-labourers, to be afterwards mentioned. A number of female servants are also kept, particularly in the more northern parts of the kingdom, who, besides milking the cows, and assisting in weeding the crops, and taking care of the house, and the farmer's children, are employed in spinning lint yarn, to be manufactured into linen, for the use of the family *.

* It may not be improper to give a general view of the system adopted in some of the southern counties of England, in regard to farm-servants, for the sake of comparison with the preceding statement.

1. The general mode of paying farm-servants, (not labourers), in England, is by yearly wages in money, with board in the farmer's house.

On the whole, it is impossible to form too high an idea of the excellence of the Scotch farm-servants, in the more improved districts of that kingdom. It is justly remarked in the Carse of Gowrie, that notwithstanding the improved implements which have been introduced into that district, yet [that farming there would have been in a very backward state, if it were not for the valuable servants of

2. In general no perquisites are allowed to farm-servants ; but in Suffolk, the tradesmen with whom the farmer deals, gives his men from 1s. to 2s. 6d. to spend at their harvest-home. 3. Servants are never allowed any emolument by working for other men than their masters. 4. Servants drink what small-beer they please ; the allowance of ale, is usually a pint at each of the three meals, (some only a quart a-day), except in harvest, when three quarts a-day are allowed ; and whenever the farmer wants to excite diligence, it is done by ale. 5. Servants cannot insist on any thing that relates to the feeding of horses ; but they prefer the service of those who feed well, and keep crack-teams. Servants are very apt to give more corn than their masters allow, and complaints are very common before magistrates on this head. 6. The farmers who keep crack-teams, indulge in expensive harness, with bells in unison, &c. ; and servants like to let themselves to such masters ; but such appendages to the harness is never insisted on. 7. In winter the hours of work are from light to dark, but the horse-keepers are in the stable two hours before it is light. In summer the teams are in the fields at six o'clock ; they plough for eight hours, or eight hours and a half, but breakfast under the hedge : this for one journey, but two journeys are common ; in which case they breakfast before they go out ; plough four, or four hours and a half; come home to dine and bait the horses, then out again to plough for four or four hours and a half more. Servants, not ploughmen, work from six to six, except one hour and a half for breakfast and dinner. 9. No allowance of days for fairs ; if asked, which may happen once or twice a-year, it is gratuitous in the master. 10. It is not at all common for servants to refuse to work, except under certain bargains, in harvest ; in which they will do no other than harvest work ; but farmers are attentive to have jobs of various sorts ready, to which they can set their men, in case of weather too bad for working abroad.

which they were possessed. Mr Walker of Wooden states it to be his firm belief, that there is not, in any country, a more temperate, virtuous, and deserving set of people, than the hinds, or married servants of Roxburghshire, and their families; and a respectable farmer in East-Lothian, (Mr Pringle of Ballencrief), who has travelled even into foreign countries in search of agricultural information, represents the farm-servants in that district, as almost always sober, steady, and regular; and, on the whole, the best servants he ever saw *.

SECT. III.—*Apprentices in Husbandry.*

It is much to be regretted, that the plan of having apprentices in husbandry is not more common. Mr Walker of Mellendean, who has adopted that plan, has favoured me with the following account of his system, which I hope others will be induced to follow, when they are made acquainted with its nature. He informs me, that the young men whom he has hitherto had under him as apprentices,

* Unfortunately this character is not applicable to the servants in the neighbourhood of great towns, who, in various respects, are of a description materially different, more especially in regard to their moral character, their industry, and their zeal in the service of their masters. In regard to the account above given, of the situation of farm-servants in the more improved districts of Scotland, the late Mr Money Hill, an eminent agriculturist in Norfolk, was so much struck with the information it contained, that he declared it to be “the most valuable document that had ever come under his consideration.”

have uniformly paid him ten pounds. Some of them remain two years with him, but the greater number only one. They eat in his kitchen, where they have always plenty of plain wholesome food. He takes none who are above living in that way, or who will not put their hand to whatever is going forward on the farm. He has sometimes been offered ten times the above sum to take in young gentlemen, to eat and associate with his own family, but this he has uniformly declined. These young men have an opportunity of attending to every operation of husbandry, as practised on Mr Walker's farm, and are taught to sow, to build stacks, to hold the plough, &c. Having hitherto been fortunate enough to have none but steady young men, he rather considers them profitable than otherwise, and at some seasons he finds them particularly useful. In other cases, farmers have been prevailed upon to receive young men who are above common labour; and it is certainly an advantage, where circumstances will admit of it, that the apprentice should be occasionally taken to markets, and should have the benefit of the farmer's conversation, and instructions, in the higher departments of his business.

What a pity it is, that experimental farms were not established at the public expence, where not only persons in the inferior classes of society, but even those connected with the higher ranks of life, might be instructed, as apprentices, or students, in the practical details of agriculture.

Sect. IV.—*Of Day-Labourers.*

IN addition to the farm-servants of various descriptions above described, a number of other labourers are occasionally employed in various operations about a farm, as women and children at turnip hoeing, &c.; men to cut the hay; reapers to cut the corn: many are also employed in scouring ditches, clipping hedges, draining, enclosing, &c. so that the number of persons employed in a district, under an improved system of husbandry, can hardly be enumerated *.

The wages vary in different districts, according to the nature of the work to be performed, and other circumstances. It is well observed by Mr Church of Hitchill, that field work ought, as much as possible, to be tasked out, or let by the piece or job. Were this generally done,

* The hinds and house servants have sufficient employment, in ploughing, and other operations connected with the cultivation of the farm, the labouring work of which, as hay-making, mowing, hedging, ditching, draining, and the like, is performed by *hired labourers*, either by contract or piece work, or by wages varying from 2s. 6d. a-day in summer, to 1s. in winter. When hired for the whole year round, such labourers generally receive from 10s. 6d. to 12s. a-week. Kerr's Berwickshire, p. 418.—The hours of labour, during eight months, are from six in the morning till six in the evening, with one hour for breakfast, and one for dinner, at nine and one o'clock respectively. In the four winter months, of November, December, January, and February, work continues during good light, when frost allows, and breakfast is taken before work begins. Kerr's Berwickshire, p. 419.

the same number of hands would go through much more work, than they will do by day wages ; and by this method also, more labour would be gained to the community, and generally at a cheaper rate to the employer. The only argument against piece-work is, that unless the farmer is a complete judge of his business, and diligently super-intends the execution, the work will often be slovenly performed.

In regard to day-labourers in general, the subject has been already so frequently discussed, that it seems unnecessary to dwell upon it at any length. The whole plan of having married farm-servants, however, according to the system adopted in the more improved districts of Scotland, having never hitherto been minutely explained, I thought it my duty to enter into it in detail, as it seemed to me peculiarly well entitled to all the attention that could possibly be bestowed upon it.

SECT. V.—*Arrangement of Agricultural Labour.*

IT may not be improper here to state some observations transmitted to me by Mr Church, on the judicious arrangement of agricultural labour, one of the most important branches attending the management of an arable farm. On it indeed, in a greater or less degree, hinges the profit or loss of the farmer. To dispose of the labouring persons and cattle upon a farm, at such work as is likely to be the most profitable, and to see that they are fully, constantly, and regularly employed, requires, at all

times, the eye of the vigilant husbandman. Under a good system of husbandry, a farm furnishes regular employment, both to the servants and to the cattle, throughout the whole year. On a considerable farm, it is proper to have servants appropriated for each of the most important departments of labour, as there is often a great loss of time, where the same persons are frequently changing their employments. Besides, as Dr Smith has so ably elucidated in his description of pin-making, the work is executed, not only more expeditiously, but also much better, in consequence of the same hands being constantly employed in it. For that purpose, the ploughmen ought to be kept chiefly at work with their horses, in ploughing, or carting; and indeed, (as an English gentleman has well observed), in Scotland they are in a manner tied to their horses, having hardly any work to do independent of them. They are therefore as careful of, and as much attached to them, as if they were their own. Every ploughman also, besides the care of his horses, has his harness, plough, cart, &c. for which he is responsible. Common or day-labourers ought to be almost exclusively employed in draining, ditching, &c.

CONCLUDING REMARKS

ON THE

SUBJECTS DISCUSSED IN THE THREE PRECEDING

DISSERTATIONS.

ON the whole, what spectacle can be more delightful, than to see a large estate, under the direction of an intelligent landlord, or of one competent to the task of managing it to advantage, where the farms are of a proper size, where they are occupied by industrious and skilful tenants, anxious to promote, in consequence of the leases they enjoy, the improvement of the land in their possession ; and where the cultivation is carried on, by a number of married servants, enjoying a fair competence, and rearing large families, sufficient, not only to replace themselves, but also, from their surplus population, to supply the demand, *and even the waste*, of the other labouring classes of the community ? Such a system has, I believe, been brought to a higher degree of perfection, and is carried on to a

greater extent, in the more improved districts of Scotland, than in any other country in the universe *.

* What a contrast between a country, under an improved system of husbandry, and one where the art of agriculture is either unknown or neglected. Compare, for instance, the state of the Lothians at this time, with that of the Isle of Man, as described in the following paragraph, taken from a manuscript collection of law cases extracted out of the ancient records of that island, by J. Parr, anno 1699.

"*Anno 1649*, was a direct famine ; domiciliary visits to farmers ; every housekeeper ordered to spare two meals a-week from themselves and families, to distribute among the poor. Many died through hunger ; most part of the poorer sort scarce able to stand for want of sustenance."

What was any scarcity we have lately experienced in this country, to such a state of real famine, thus briefly described ?

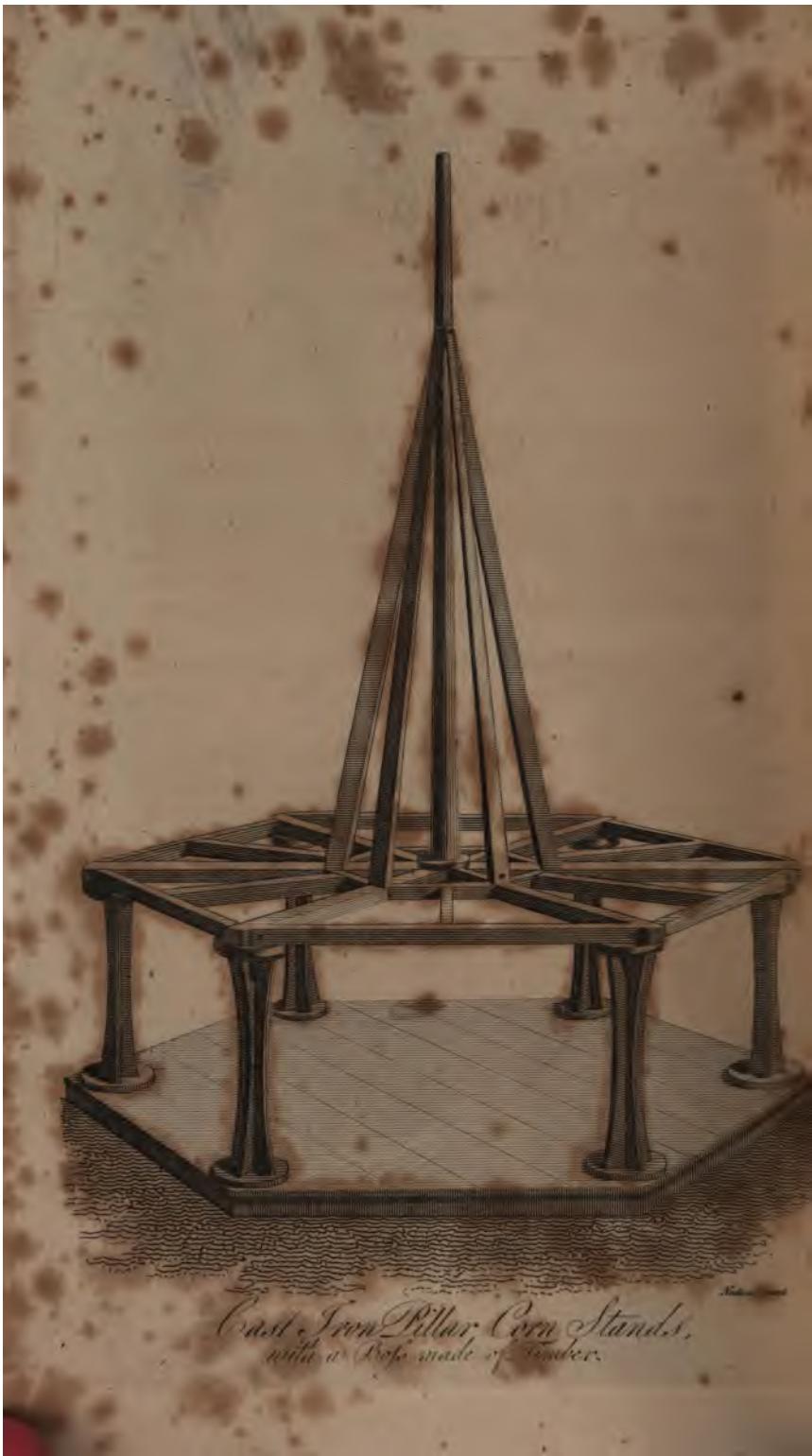
The importance of agriculture is strongly inculcated in the following passage from Aristotle, (Polit. L. I. c. xi. p. 308, Edit. du. val.), who was fully convinced, that the labours of the husbandman were the surest sources of national happiness and prosperity.

The following translation gives but a faint idea of the strength and beauty of the original :—“ Having thus given the theory of economy, we now proceed to the practice, observing, that as the theory is a liberal study, the practice is a necessary occupation. Whoever, therefore, would surely and honourably improve his fortune, must first acquire an experimental knowledge of the various kinds of cattle, horses, oxen, and sheep ; he must examine their many and excellent qualities and uses, all subservient to the purposes of human life ; he must consider and compare their respective advantages, in their relations to each other, as well as to the local circumstances in which he happens to be placed. Having thus provided himself with cattle, the living instruments of agriculture, he will next direct his attention to this most useful art ; distributing the labour of his household, as circumstances require, among the various branches of tillage, and plantation, without neglecting those benefits that spontaneously offer themselves from bees, birds, and fishes. Such are the most natural and best methods for improving the national wealth, and augmenting the public stock.”



APPENDIX.





*Bast-Iron Pillar, Corn Stands,
with a Roof made of Timber.*

APPENDIX.

No. I.

OF VARIOUS CIRCUMSTANCES WHICH HAVE INDIRECTLY CONTRIBUTED TO THE EXCELLENCE OF SCOTCH HUSBANDRY.

IN addition to the reasons assigned in the Introduction, other circumstances have likewise indirectly contributed to the excellence of the Husbandry of Scotland; some of which it may not be improper briefly to enumerate, as meriting some consideration.

1. The inferiority of the climate of Scotland, compelled the farmer to pay particular attention to every means by which so great a disadvantage could possibly be counteracted *.

2. The small proportion of fertile land which it possesses, rendered it peculiarly valuable, and was a strong inducement to make it as productive as possible. Where Nature is bountiful, man is too apt to become indolent.

* It is said, if inferiority of climate is a source of excellent husbandry, the best specimens of Scotch farming should be found in the Shetland Islands. This, however, is carrying the argument to an extreme. It is a well-known fact, that in warm climates, men are habitually too indolent to be good farmers; and where the soil is also fertile, they have no call for exertion; whereas, where the soil is fertile, and yet the climate is unfavourable, it requires a continued exertion to counteract its influence. This tends to promote good husbandry, for the farmer must be continually on the alert. In the same manner, in Holland, the *houses* and *furniture* are in a remarkable degree clean, owing to the dampness of the climate, which would destroy both, but for the perpetual attention of the people, by rubbing and scrubbing, to counteract the bad effects of so moist an atmosphere.

3. The skill and experience which the Scots had acquired in gardening, convinced them how productive land might be rendered by due attention to its culture.

4. It was in the counties which border upon England, that the improved system of Scotch Husbandry began; and there arose, at the same time, a laudable spirit of emulation between the borderers of the two kingdoms, which tended to promote their mutual improvement.

5. It has been justly remarked, that agricultural improvements began to appear at an earlier period in England than in Scotland, before the human mind had fully ripened, and before a knowledge of mechanics, or the habits of mercantile accuracy, had been brought to any degree of perfection; and rules, to a certain degree advantageous, having been once established, there arose a strong prejudice in their favour, which it was difficult to eradicate; whereas the improvements of Scotland commenced at a more advanced and enlightened period of society, when great progress had been made in the arts, and in the conduct of every species of business, and after a general spirit of inquiry, of industry, and of exertion, had been excited.

6. In many parts of England, more especially in the neighbourhood of manufacturing and commercial towns, the sons of farmers, owing to the uncertainty of the tenures by which farms are held, and the consequent precarious and dependent condition of the farmer, were induced to become manufacturers and merchants, instead of continuing in the farming line, and thus transferred to commerce the capitals acquired by husbandry; whereas, in the improved districts of Scotland, the reverse very frequently takes place; and many farmers are to be met with, who have been trained to other professions, but who prefer the agricultural to every other occupation, not only as being the most rational, but, on the whole, when conducted on a proper scale, and where leases are granted, as liberal and as independent as any other, and equally advantageous *.

* Several farmers in Scotland are worth from L.10,000 to L.50,000, and some even more, all acquired by husbandry. It is only where leases are

7. The clergy of Scotland have had their full share in promoting a spirit of improvement in various parts of the kingdom. Their situation is almost peculiar to that country.—They are all resident, and by far the largest proportion of them are fixed down to their respective livings, without any reason to expect that their situation will ever be materially improved. Each of them have a small portion of land, the occupation of which they hold in the same manner as tenants on a life-rent lease; and hence have an interest to improve their little spot, to which they are often induced to rent an addition, which they cultivate with equal zeal. Less prejudiced, and possessing more extensive information, than many of their neighbours, they are often the first to suggest, and even to attempt, new improvements. When these succeed in their hands, their example is naturally followed by their parishioners *.

8. The convertible system of husbandry, or alternate grain and green crops, including the abolition of naked fallow on turnip soils, is completely established in Scotland; and is by far the best mode that has hitherto been suggested, for the productive cultivation of a much larger proportion of England, than is generally believed to be adapted to it.

9. The correctness with which the fallowing process is executed in strong soils, is one of the leading features of Scotch Husbandry. It is not repeated so frequently as it is in many districts of England, occurring, in general, but once in the course of six years; the soil of the field, however, by frequent ploughings, (six or seven times where necessary), though consisting of the strongest and most stubborn clay, is thus completely pulverised, weeds are extirpated, insects are destroyed, and fertility insured during the whole course. The depth also to which land

granted that the farmer can exclaim, in the words of Cicero,—“ *Omnium rerum ex quibus aliquid adquiratur, nihil est agricultura melius, nihil uberioris, nihil homine libero dignius.*”

* One of the best works on agriculture was written by the late Mr Adam Dickson, minister of Whittingham in East-Lothian.

is ploughed in Scotland, more especially when it is fallowed; is considered to be a great advantage.

10. Though Scotland cannot boast either of the chalk-pits of England, or the limestone gravel of Ireland, yet the Scotch farmers, aware of the importance of calcareous manures, have carried the use of burnt limestone to an extent, and manage it in a manner not to be excelled in any other district. Where shell-marl also has been discovered, it has been applied on a great scale.

11. The use of calcareous manures having augmented the crops of corn, and improved the herbage, the farmers in Scotland have been thereby furnished with an additional quantity of putrescent matter, which, in the lighter soils, instead of being mixed with them in the course of ploughing, by which much of its strength and virtue would be lost, is usually deposited, when either turnips or potatoes are cultivated, in the centre of a drill, by means of which, as much advantage as possible is derived from it; and in this way, nearly half the quantity used in other districts is found to be sufficient.

12. The instruments of husbandry adopted by the farmers in Scotland are distinguished for their utility. The single-horse cart, the two-horse plough, the fanner, and the threshing-mill, are excellent implements for the various objects for which they are respectively destined; and by their means, the expence of cultivation and labour is greatly reduced.

13. The great attention that has been paid to the improvement of the roads, has, for obvious reasons, been of infinite advantage to the agriculture of Scotland. A farmer can afford to pay a much higher rent, where he has that accommodation, than where it is not to be met with. Canals also have, in some cases, been of use; and iron rail-ways are likely to become of considerable advantage to the more interior districts *.

* The iron rail-way, from Berwick to Kelso, which may afterwards be extended farther into the interior, will be of infinite advantage to several inland districts. Other rail-ways are in contemplation.

14. The increasing price of agricultural produce has, in a peculiar manner, operated as a premium to improvement; and, it is observed, that the best cultivated districts in Scotland, are either in the neighbourhood of large towns, or where there is an easy mode of conveyance, by water-carriage or otherwise, to advantageous markets *.

If these are not to be considered, strictly speaking, as *causes* of the excellence of the Husbandry of Scotland, they are at least to be accounted *circumstances which have indirectly contributed, in a greater or less degree, to the fame which it has acquired.*

No. II.

HINTS REGARDING THE IMPROVEMENT OF WASTE LANDS.

IN the course of my enquiries regarding the Husbandry of Scotland in its more fertile districts, some useful facts and observations were incidentally transmitted to me, on the subject of improving the waste lands of the kingdom. These I have thought it advisable to annex, by way of Appendix, to the preceding account of the more improved Husbandry of Scotland, to prevent the risk of their being lost. They relate to the following particulars: 1. The possibility of improving waste lands; 2. The various modes of improvement; 3. The proper breadth of ridges in new improvements; 4. The cultivation of grass on such lands; 5. The distinctions of natural meadows; and, 6. The improvement of wastes in fertile districts; which may be adduced as a proof of the advantages to be derived from a General Bill of Inclosure.

* What an advantage is not the Morpeth market to the farmers in the two counties of Berwick and Roxburgh?

1. On the Possibility of improving Wastes.

The common description of a waste country, is enough to deter any individual from attempting its improvement, unless impelled by the strongest personal interest. What can be more unpropitious than an uninclosed tract, encumbered with large stones, greatly in want of drainage, over-run with furze and heath, with a sterile soil, and a weeping climate, presenting difficulties not easily to be surmounted; yet, notwithstanding these unfavourable circumstances, such lands are, *to a certain extent*, susceptible of improvement. Such a soil and climate, with proper culture, will produce roots and herbage for improving both stock and sward, though not in the same degree, yet in no small proportion to what has taken place on more favoured situations. Potatoes, turnips, cabbages, sown grasses, and tares, may all be raised. Want of manure is the great obstruction; but were all the coarse herbage to be procured in such wastes, cut and preserved for raising potatoes in drills, laying it below them on land that had been but two years limed and broke up, a good crop would be obtained. The cultivation of these crops, would not only improve the pasture, but afford, at all seasons, a supply of food, that would increase the value of cattle fully in proportion to what takes place elsewhere *.

2. Modes of Improvement.

There are five modes which have been tried in Scotland, for improving such waste lands: 1. By ploughing; 2. By trenching; 3. By paring and burning; 4. By floating away the sterile surface; and, 5. By flooding, or covering the whole surface with water.

1. Mr Walker of Mellendean improved a piece of high ground, situated about three miles from Kelso, and seventeen from lime, originally muir, intermixed with small spots of sandy soil, and covered with whins, in the following manner. He generally broke

* Extracted from the communications of Mr Scott of Craiglockhart, and of Mr Dudgeon of Primrose Hill.

up from 15 to 20 acres yearly. When first ploughed, the furrow was laid as flat on its back as possible, and allowed to remain in that state from 15 to 18 months, in order to rot the sod or turf; about Midsummer it was cross-ploughed, and after being harrowed 12 or 14 times, (or what is called there six or seven double tines,) it received the lime, was ridged up, and sown in the following spring with rye or oats, generally the former, having found it to be a more certain crop than oats upon that kind of soil; the average crop, from three and a half to four bolls per acre. As soon as the rye was cut, the ground was ploughed again, and a crop of drilled turnips (with dung) taken the following season; the turnips were eaten on the ground by sheep, and then sown down for pasture with the first crop after the turnips. After remaining a year or two in grass, innumerable shoots of young whins made their appearance. These, when a year old, or nearly so, were regularly drawn out in soft rainy weather by the shepherd, the only servant kept on the ground; and as this was executed without taking away his attention from the flock, it was done at little or no expence. On the improved part of the land, which was laid down to grass, Mr Walker keeps his young sheep in summer, and his breeding ewes in winter.

Mr Blaikie of Holydewn has made considerable improvements on a farm called Clinton Moor, containing about 800 acres. He describes it as being a perfect waste, not so much as a house upon it, a cold climate, two thirds of the farm a thin wet soil, with a yellow tilly bottom, the surface covered with a coarse kind of grass, a mixture of bent, ling, and some heath; the grass in spring so dead that it would blow away by a high wind, or burn as well as any mountain heath; the other one-third short heath, almost without the appearance of grass, and in many places quite naked.

The ground being quite open, he was first under the necessity of dividing it by hedges and ditches into suitable inclosures, such as the nature and situation of the soil would admit of. The plan he adopted was, to tear up about 50 acres annually, to rest it in that state for two years; then to cross-plough and harrow it, then another ploughing and harrowing, then to lay on shell-marl, at

the rate of 40 double carts per acre, and after that, a shallow ploughing with a slight harrowing, so as to mix the marl with the soil *. The land was thus materially reduced, and before winter it was gathered up into ridges, ten feet broad; from the thinness of the soil it could not be mounded up into broader ridges; indeed, as it was, the furrows were left bare.

The first crop of oats was never worth more than the seed, if so much; then he took a second crop, which ripened in good time, and produced on an average four bolls. There was sown along with that crop, one bushel and a half of rye-grass per acre, with a mixture of white and yellow clover; he then took a crop of hay, eighty or ninety-six stone average per acre; next winter ploughed again for a crop of oats, average four bolls; then fallow, and on some of the driest parts turnips, dressed with dung and moss, of which there was plenty; then another crop of oats or barley; sown down again with grasses fit for the soil; then pasture till it grows more solid, before opening for another course; but never two white crops afterward, without an intervening green crop or fallow. What effect lime would have had on such a soil, cannot be stated; as lime could not be had there under 10s. per boll, it would not probably pay the expence.

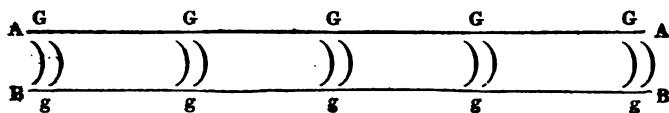
2. A most intelligent correspondent states, that he is decidedly of opinion, that *trenching* of all muir grounds, improved for corn cropping, would be the most lasting and beneficial mode of improving them. The sterile surface, which is composed of muirish earth and vitrifiable sand, should be turned down, without the reach of the roots of the crop, and the bottom soil, which is in general a *till*, turned up, exposed to the sun and air, and if manure were applied to it, would prove a kindly soil, particularly where the bottom was made free and drained, by the worthless

* The plan adopted by Mr Barclay in Aberdeenshire, is, where heath predominates, to suffer it to remain two or three years after the first furrow, to rot and mellow before the fallow took place, at which time lime was always applied, and, if possible, dung, more or less, as it could be procured. With the first crop, grass-seeds were always sown, and the fields pastured for the five or six following years.

old surface put below it. As proof of the utility of deepening surface soils, both wet and dry bottoms, look at the parches or gardens that have received the deep digging or shallow trenching, of the cottages placed on the skirts of the muirs all over Scotland, and you will observe, the additional verdure and luxuriance of crop upon these patches, more than upon the lands adjoining, the surface of which is often very little more than scratched by the plough, and the dung and other manure applied to it has not deepness of soil to operate upon, so as to produce a good crop*.

3. In regard to paring and burning, in many situations that is certainly the best mode of improvement. Where there is a rough and barren surface, over a fertile loam or clay, it is desirable to get rid of that surface, at almost any expence; but if, in addition to the advantage of clearing the ground of such a nuisance, you can also convert it into a source of fertility, what can be more desirable? By means of paring and burning, the Author of this work raised, by the first crop, what would pay all the expence of the improvement; and then by laying it down to grass, it gradually acquired strength and permanent fertility:

The operation of paring and burning is likely to be much facilitated, by a very cheap and simple contrivance invented by William Aitchison, Esquire, of Clement's Wells, near Musselburgh. It is a portable furnace for burning sods, made of old cast iron hoops, of the following shape.



The Two pieces of hoops A and B are made straight to lie on the ground, and the half hoops g g g g, are fixed to them by rivet nails. They are about four feet long each, and so light,

* It is remarked, however, that cottage gardens get more dung than could be given to larger tracts.

that a boy could run about with two of them in each hand. Turf being laid along the sides, and over the top, they keep an opening through the hoop for air to make the fire burn. Before this invention, it was very difficult to get the turf sufficiently dry in so moist a climate, and the process was extremely expensive and uncertain; but this simple apparatus keeps the turf always open, and ready to receive air, by means of which a few hours of dry weather makes it fit for burning. The expence of these turf kilns is but trifling, and by their means, when once the small quantity of turf is set on fire, a great deal of it may be burnt in one day *.

4. There is another mode of improving waste lands, which seems to be peculiar to Scotland; it is that of conveying away, by means of water, the moss or peaty earth, with which sometimes the richest clay is covered, so as to render it accessible to cultivation. This method was either improved upon, or discovered by that able agriculturist, the late Lord Kames; and by his efforts, and those of his public-spirited representative and successor, many hundred acres of land have been converted, as if by magic, from black moss, where hardly a snipe or muir-fowl could find subsistence, to rich and fertile carse or clay-land, worth from L.3 to L.5 per acre †.

5. There are three modes of employing water in the improvement of land; 1st, By *irrigation*, when the water is spread over the surface, and immediately runs off. 2d, By *warping*, when water saturated with mud is kept on the land till the mud is deposited; and, 3d, By *flooding*, when land is overflowed by great quantities of water, more especially in the winter season, for the

* It is worth consideration, whether the same process might not be applied to the burning of kelp.

† There is an excellent account of this in Brown's Treatise on Rural Affairs, vol. i. p. 106. It would be desirable to have estimates made out of the expence and profit of cultivating waste land in Scotland, according to various plans that might be adopted, as being the most advantageous mode of expending agricultural capital, where the rent of improved land is so high.

purpose of promoting the production of either Grain or Grass. This last mode has hitherto been but little attended to in this country, though it is said to be much practised in Holland. Where there is a stream of water, there is a doubt that the best way of using it, is to irrigate in the manner practised in the west of England. But there are many places where there is not enough of running water to irrigate, where pieces of land could be flooded by stagnant water in winter, either during a part of that season, or the whole of it.

It is certainly of consequence to investigate what use could be made of such situations. It may be asserted, as a preliminary observation, that it is necessary to have the power of letting off the water completely, and leaving the piece of land perfectly dry, to derive any advantage from this situation.

It is to be considered, in the first place, what advantage may be derived from this circumstance, by taking a crop (say of Oats) after the flooding; no reasoning can be drawn from the crops produced by the overflowing of the Nile, and other rivers which deposit rich mud, to the present investigation; in the latter case, the course of the water is short, and can bring little or no mud.

I have often heard that a field of about twelve Scots acres, in Baltmuir, about two and a half miles from Peterhead, after being covered all winter with stagnant water, yielded every year a good crop of Oats; but the soil is a rich clay.

What effect this kind of stagnation may have on poor soils, as to producing crops of Grain, and how long the water should be stagnated, remains to be investigated. I have been informed that the late John Wynevs, Esq. at Brettenham, in Suffolk, had a fish-pond of eight statute acres, the water of which he let off every seventh year, and sowed the mud with Oats, and rarely had less than ten quarters per acre. I do not know what the soil is in this case *.

* The pond in question was formed by a head across a vale; the country in general around it is of a strong wet loam, on a clay marl bottom; but the valleys are very often a gravelly loam. As this pond was a very old

The next question to be investigated is, how far water stagnated for the whole, or part of the winter may be of use in producing Grass or Hay? Dr Rennie, in his late excellent Essay, has shewn how it will destroy the plants in a poor surface, which is certainly an important object. But it has not yet been ascertained how it will operate to produce Grass or Hay. We see that in many meadows, those at Ferrybridge, Newark, Wansford, Wester Newton, &c. where the meadows are flooded for a considerable part of the winter, that they are very valuable; but there are considerable rivers running over them, which bring a great deal of rich mud with them, and they are not flooded during the winter, but the water occasionally subsides; whereas in the case proposed to be investigated here, it is supposed, that there is only water sufficient to flood the land once, and that it cannot carry mud along with it.

Perhaps the mode of proceeding in this investigation is, first to discover how long the water may be stagnated, without hurting the roots of the Grass, and then observing whether this degree of stagnation will have the effect to produce a crop of hay every year. Perhaps the Dutch mode of draining their meadows by windmills, may throw some light on this enquiry; as would, likewise, answers from intelligent agriculturists, according to local circumstances, to the following

Queries regarding the Flooding of Land.

1st,—What rivers in your neighbourhood, or within your knowledge, are liable to overflow their banks, and at what season of the year?

2d,—Are meadows on the banks of such rivers damaged or improved by such floods—reference being had, not to the loss of Hay, but only to the improvement of the soil?

3d,—If floods are found to be beneficial, which are most so, those of winter or of summer?

one, and rarely or never cleared of mud, the Oats vegetated entirely in the mud;—a very small brook ran through the pond.

4th,—What, in this respect, is the distinction between the water of floods which deposit mud, and other waters which come down comparatively clear?

5th,—If the herbage of meadows is injured by floods, how long is it before such herbage recovers the injury?

6th,—After such recovery, is the meadow found improved?

7th,—If injury be the consequence of floods, how long must the water continue on the land to produce that injury?

8th,—Does the degree of the injury depend on the soil of the meadow—gravelly soils, clays, and peat?

9th,—When floods happen just before the time of mowing, (and probably bringing down sand or grit, or mud, to the great injury of the crop), does the farmer mow or feed it, and does he wait for rain to wash the herbage?—in such cases, what is done with the Grass, if mown; and is it not injurious to Live Stock?

10th,—Do not floods, even when they enrich the soil, tend to make the herbage coarse?

11th,—Upon the arable lands in the Fens of Cambridgeshire, what is the effect of floods?—do they tend to enrich the soil, or the contrary, for succeeding crops?

12th,—In the same country, what is their effect on grass land?

13th,—In the same country, when (from very great breaches in the banks) lands have been two, three, or more years under water, has the soil been enriched or damaged by such floods, when again brought into cultivation?

14th,—Did you ever know a flood of such duration as to entirely destroy vegetation of herbage?

15th,—Has it come to your knowledge, that on draining any lake, or large pond, the same was converted to arable land, and (if so) with what effect? specifying the sort of soil?

3. Proper Breadth of Ridges, when Waste Lands are improved.

There is nothing more essential, than to render waste lands, when improved, as dry as possible; and for that purpose, I am

convinced of the superior advantage of making the ridges wide and high, not in mossy land, but where the soil consists of earth of a soft or spongy quality.

New land, (more especially where the bottom is till) is generally of that description, retaining a great superfluity of water, which prevents any manure, whether lime, dung, or marl, from operating on it successfully. But this great obstacle to the improvement of waste lands would be obviated, by the use of wide and high ridges.

By this means also, the land might be dunged, ploughed, and harrowed, and afterwards pastured on, at times, when it would otherwise be impracticable.

I have seen very good crops of corn raised on new land, in *lazy-beds*, when they could not be obtained in any other way. This was entirely owing to the height of the ridges, and the consequent dryness of the land. *To cottagers bringing in new lands this plan is particularly recommended, not only for potatoes, but for all their other crops.*

But as it is impossible to cultivate large tracts by the spade, the best plan to pursue, with the plough, is, to widen the ridges from 16 to even 30 feet, by means of which the land would be kept dry. This was the plan adopted by ancient farmers, and is sanctioned by their experience. Some ground in this way would be lost by the furrows; but as soon as the land was brought into thorough good order, and of as firm a consistency as old land, the plan of smaller ridges might be adopted. This plan is peculiarly necessary in districts subject to all the disadvantages of a wet climate. In that case, covered drains in the ditches would be advisable.

4. *On the Cultivation of Grass on Waste Lands.*

Though grain may be cultivated on lands possessed of great natural fertility, yet grass is the stimulating cause, and principal source of the culture and improvement of weak soils, and of barren districts. In such cases, it is from grass alone that the remuneration can be looked for by the farmer. Not that such soils

produce grass in great plenty, or of very good quality; but in this way it is giving something, whilst a stop is put to farther expenditure *.

In carrying on the improvement of a farm, it is a general rule, that the best land should be first improved, as that is the only description of soil that brings immediate profit; and the farmer is thereby enabled to go forward. In regard to waste lands, the great object is to bring them into grass. The crop of grain is but a secondary object; it is the pasture grass that may be obtained, that is the cause of its cultivation †.

When waste lands are laid down to grass, Mr Walker of Meldean recommends to sow grass-seeds in the following proportions; about eight pounds of white, three pounds of red, and three pounds of yellow clover, and rather more than half a bushel of rye-grass, per English acre. Cocksfoot, however, is now peculiarly recommended for such lands.

5. *Distinction of Natural Meadows.*

In many parts of Scotland, there is a species of bog or marsh, which is provincially called meadow. It is always overgrown with coarse grass, rushes, and various other aquatic plants, and when occupying part of tillage fields, is generally cut for hay. When these meadows are found on stock farms, in high situations, few are so ignorant of their value, for pasture to cattle and sheep in winter, as to attempt, or to desire, to render them arable; but the propriety of reclaiming them, when found in low arable farms, has been disputed. Mr Low is decidedly of opinion that these bogs, when on free subsoils, may be improved and cultivated to very great advantage; but when on a retentive till or moss, (of which last they often seem almost entirely to consist) experience warrants him in asserting, that they ought not to be disturbed by the plough. They afford a good crop of hay, as substantial food for cattle in winter; they yield a great

* Communication from Mr Barclay, Mill of Knockleith, county of Aberdeen.

† Ditto.

deal of manure, without requiring any ; and they are not rendered fit to bear corn crops but at a vast expence.

6. *On the Improvement of Wastes in Fertile Districts.*

Mr Brown of Cononsyth, near Arbroath, has communicated to me the following method which he has adopted, for bringing waste lands into cultivation, and which he has found to answer well.

The soil on which he tried the experiment was a poor clay, rather stony and wet, covered with heath and furze. After clearing it of stones and other obstacles, and draining it by open ditches, he gave it as deep a furrow as four good horses were able to draw ; and if the ground was very wet at the time, so much the easier done : *it was often performed when the horses would be idle in the stable*, by the rest of the farm being drenched with rain : it was allowed then to lie till the following spring, when it got a good rub of harrowing, so as to fill up the seams betwixt the furrows. Next year it was fallowed and limed, at the rate of 40 bolls lime shells *per acre*, and 15 or 20 loads of dung, and sown with wheat about the beginning of September; which seldom failed to give a good crop, and then it came into the rotation with the rest of the farm. He thinks that waste ground should never get the second or cross furrow until the first furrows are grown fast together, or about two years after the first ploughing ; if sooner, it requires double the labour to fallow it, exhausts the soil, and cannot possibly be got so well finished. This is one proof, among many others, of the advantage of improving waste lands, by farmers possessing arable farms in their neighbourhood, as the labour can be executed without extra stock.

It is impossible to conclude this paper, without lamenting the little attention that has hitherto been paid to the improvement of our waste lands. Many years have now elapsed since the necessity of rendering our barren wastes productive, was recorded on the Journals of Parliament ; and yet every attempt to render those most important resolutions effectual, has in a great mea-

sure been in vain. The consequence has been, as was foreseen, frequent scarcities, immense importations, an unfavourable rate of exchange, a high price for bullion, and all the mischiefs which have thence originated. The advantage of a general bill of inclosure is, that in every parish something may be done, thousands of farmers may each of them be improving a few acres, and in this way of improvement may be carried on more advantageously to the public, and more likely to become speedily productive, than if large tracts were undertaken by any particular individual. Indeed, if the land, instead of being inclosed, was merely *partitioned* among the persons having interest therein, it would be a material object gained.

No. III.

ON THE NECESSITY OF AN ACT OF PARLIAMENT TO ENCOURAGE DRAINING.

BY THE REV. WILLIAM DALING, MINISTER OF CLEISH, BY KINROSS.

An act of Parliament to encourage draining in Scotland is much wanted. As the Parliament have rewarded the inventor of a new method of draining, upon condition of its being made public for the advantage of the country, it is to be hoped that they will remove the greatest obstruction which at present exists to the draining of wet land in Scotland. This obstruction consists in a deficiency in those acts which have contributed so much to raise the agriculture of Scotland to its present state of excellence. We have laws for dividing runrig lands and commons, for straighting marches, and making march-fences; but we cannot oblige our neighbours to join in a common drain, as

we can do in a common fence. Yet the former is of much more importance than the latter; for ground may be highly improved and excellently cultivated, without fences, as the Carse of Gowrie is; but wetness is a bar to all improvement. A great deal of wet land would immediately be brought into cultivation, if an act were passed, proceeding upon the following principles:

1. Every person should be entitled to have his ground made and kept dry.
2. The expence should be defrayed by the persons who receive advantage from the drain, and in proportion to the advantage received, as ascertained by arbitrators, or commissioners nominated for that purpose.
3. Full compensation should be made to those whose property may be injured in draining the grounds of others.
4. The method of carrying the law into execution should be so cheap and easy, that the advantage of it might be within the reach of every one who has the smallest quantity of ground to drain.

For that purpose, the method of proceeding might be the same which is already established in the cases of marches, &c. If the persons concerned could not agree among themselves to settle the business by arbitration, they might apply to the Sheriff: if it was found necessary to go to the Court of Session, that Court might settle it, as they do the division of commons, by sending commissioners to the place. A litigious spirit should be checked, by the Judges giving expences, or damages, if necessary.

Our ancestors, in framing the laws concerning the division of commons, and the inclosing of land, have evidently proceeded upon this principle, that every man should have the complete enjoyment of his property, so that he may be able to manage it any way that he thinks best. And if the advantage, and proper method of draining, had been as well understood when these laws were past, as they are now, a draining act would also have been made, and the improvement of the country would have been much greater than it now is. But as it has hitherto

been overlooked, the present seems to be a very proper time for bringing forward such a measure, for the following among other reasons :

All men are now sensible of the advantage of draining. Wet ground is generally rich, and will, when drained, produce excellent crops for several years, without manure.

Many tracts of wet land have also the advantage of climate, as they lie low, and upon the banks of rivers ; so that they would form a valuable addition to the corn lands of Scotland: And such an addition would be extremely desirable, as a great proportion of the surface of the country is not arable, and can never be made so.

At present, in particular, an additional quantity of corn land would be of the utmost importance, when the country does not raise corn sufficient for its own consumption, and when our supplies from other countries are in a great measure stopped.

The cultivation of the wet grounds would increase the quantity of manure for those which were before in tillage : if they are ploughed, by the straw and corn ; if kept in watered meadow, by the superior quantity and quality of the produce ; for dung, except in a few situations, cannot be purchased.

The attention of the public has of late been drawn to the cultivation and uses of moss, a subject of great national importance; here also the advantage and necessity of draining are evident.

The improvement of the climate is an obvious effect of draining. The great evaporation that takes place from the surface of bogs, must render the air much damper, and much colder, than it would otherwise be. Consumptions, the rheumatism, and probably other diseases, would thus become less frequent.

The beauty of the country would be improved in a very high degree. A taste for neatness and ornament is now much more generally diffused than it was at any former period: it is the sign of the increasing wealth and improvement of the country.

There are now many persons completely qualified to direct the formation of drains, and plenty of labourers to be got for executing them. At present, especially, when such numbers

are out of employment by the stagnation of trade, a draining act would have the effect of setting many of them at work, and in a way most beneficial to the public. Those who could not use the pickaxe and spade, might be equally useful with the wheelbarrow: women could be employed in this manner, as they always are in peat-mosses.

In some cases, the same cut which serves for drain, might form part of a canal.

Neighbours often quarrel about the draining of their grounds: but if it were always in the power of any one of the parties, to settle the dispute by arbitration, quarrels would soon be settled, and soon forgot, when the good effects of the draining were experienced. Probably no man ever repented the draining of wet ground: of other things which were supposed to be improvements, as much cannot be said.

If such a law were made for Scotland, it would save time and trouble to parliament, and much unnecessary expence to individuals*. Perhaps England and Ireland also, if their laws are in that respect deficient, would follow our example.

It is to be hoped that some public-spirited institution will step forward, and be the means of procuring such an advantage to their country.

* The same idea of a law to facilitate draining, occurred to the intelligent Reporter of Berwickshire, An. 1809. See Report, p. 490. p. ii.

No. IV.

PROOFS OF THE UNFAVOURABLE IDEA ENTERTAINED BY BRITISH STATESMEN, OF THE ABILITY OF THIS COUNTRY TO RAISE A SUFFICIENCY OF GRAIN FOR ITS OWN CONSUMPTION, AND OF THE LITTLE IDEA THEY ENTERTAINED OF THE IMPORTANCE OF AGRICULTURE, PRIOR TO THE ESTABLISHMENT OF A NATIONAL INSTITUTION FOR PROMOTING ITS IMPROVEMENT.

In the year 1790, the Committee of Privy Council, appointed to enquire into all matters relating to trade, took into its consideration the laws regarding the exportation and importation of grain, and presented a report to his Majesty upon the subject, which is drawn up with much ability, although with such little idea of the *agricultural resources of the country*, that we are told, we must depend for a part of our consumption, not on an increased cultivation at home, not even on the produce of Europe, but on the harvests of America. Yet in the year 1808, as appears from the customhouse accounts, we exported corn to the value of £470,431, and imported only to the amount of £336,460; consequently Great Britain became again an exporting country, and for that year at least, with the assistance of Ireland, was independent of foreign nations for food.

In the year 1791–2, Mr Pitt explained, in a speech on the state of the nation, what appeared to him the causes of the general increase of the national prosperity which had taken place at that time. That speech is very ably commented upon by Mr Arthur Young, in his *Annals of Agriculture* *. Mr Young was

* Vol. xvii. p. 369.

shocked to find, in that speech, the greatest, dearest, and most important interests of the kingdom, totally and contemptuously overlooked, as of no sort of consequence in the great scale of national prosperity. A financier, he observes, in giving a general view of the national resources, and dwelling with pride on the public revenue, does not think that agriculture, which, even then, paid twelve millions sterling *per annum*, in public burdens, worthy even of being named amongst the sources of prosperity!

Mr Young also remarks, “that the agricultural interests of this kingdom, perhaps never found themselves placed in so contemptible a position, as in this speech of the minister; who, wishing to make the utmost parade of every circumstance that would count in a catalogue of national advantages, totally overlooks every thing connected with land.” Mr Young little expected, in the course of a few months, to be secretary to a Board of Agriculture, established with the concurrence of that very minister by whom that speech had been delivered.

As late as the year 1796, another British statesman, distinguished for political information, (Lord Auckland), delivered a speech in the House of Lords, which was afterwards published, and of which the following is an extract :

“ To what, under the protection and favour of Divine Providence, shall such prosperity be ascribed?—to our naval superiority and successes; to our conquests in the East and West Indies; to the acquisition of new markets; to the enterprising spirit of our merchants; to the improvements of our manufacturers; to the energy of our countrymen in arts and in arms; to the union of liberty with law; to the national character, cherished by, and cherishing the principles of our inestimable constitution; that constitution, which it has been the object of our enemies to destroy, by means and effects utterly destructive to themselves; that constitution, which it is the great purpose of our struggles, in this just and necessary war, to preserve and to maintain *.

* See the Substance of Lord Auckland's Speech in the House of Lords, the 2d day of May, 1795. London, printed for J. Walter, Charing-cross.

Not one word of agriculture in this whole paragraph, intended to enumerate the causes to which our prosperity was to be ascribed. We have hitherto indeed been too much considered as a mere commercial nation; whereas every country, possessed of an extensive and fertile territory, ought to account the cultivation of its soil, as the surest foundation of its prosperity, and the best entitled, of all the sources of that prosperity, to the peculiar attention of an enlightened government. Such a government will be ready, at all times, to remove every obstacle to improvement; if not to promote, by public encouragement, those unceasing exertions, by which alone the whole territory of a great country can be rendered, what it ought to be—one uninterrupted scene of industry and cultivation.

No. V.

ACCOUNT OF JAMES SMALL, AND OF HIS IMPROVEMENTS IN THE CONSTRUCTION OF AGRICULTURAL IMPLEMENTS.

BY SIR JOHN SINCLAIR.

Next to the pleasure of promoting the improvement of a country, by personal exertions, is the satisfaction of doing justice to the merit of those, who have distinguished themselves by their successful efforts in the accomplishment of that object. I am thence induced, to give some account of a native of this country, **JAMES SMALL**, to whom Scotland, and the agricultural work in general, are peculiarly indebted. That is the more necessary, as the services of this useful mechanic have not hitherto been sufficiently known and appreciated.

James Small was born at Upsetlington, in the parish of Lady-kirk, and county of Berwick, about the year 1740. His father's

only profession was that of a farmer. Under his superintendence, his son, the late James Small, was instructed in all the various branches of agricultural labour ; a knowledge, of which he afterwards experienced the advantages.

Young Small was first bound as an apprentice to a country carpenter and plough-maker, at Hutton, in Berwickshire. He remained in Scotland for some time after his apprenticeship was over ; but about the year 1758, he went to England, where he worked with a Mr Robertson at Doncaster, in the making of waggons and other wheel carriages.

It was in the year 1763, that he settled at Blackadder Mount in Berwickshire, under the patronage of John Renton, Esq., of Blackadder. He there set up a manufactory of ploughs and other agricultural implements ; and as he at the same time occupied a farm of considerable extent, he had an opportunity of trying many experiments, which he might not otherwise have been enabled to attempt. He there contrived a device for ascertaining the best shape of the mould-board, by making it of *soft wood*; by means of which, it soon appeared where the pressure was the most severe, and where there was the greatest friction.

When he first settled at Blackadder Mount, the old Scotch plough was almost solely in use throughout Berwickshire. It was drawn by a pair of horses, with the addition of four, and sometimes of six oxen ; the smallest number was a pair of horses, and a pair of oxen, attended by a driver.

He began with trying experiments on his own farm, with ploughs of smaller sizes, and of different forms, proving, by a steel-yard with a stronger spring than usual, which of them performed the best work with the least force of draught.

Some persons are impressed with an idea, that he had no other merit but that of introducing into Scotland the Rotherham plough, or reviving a plough that had been made by an itinerant plough-maker, called Lomax, or Lummas, many years before, but which had fallen into disuse ; neither of which however is the fact. That he was well acquainted with the Rotherham plough, appears from his own treatise on ploughs and wheel carriages, (p. 172.) ; and he probably would adopt any particulars in the

construction of that plough which might appear advantageous*: but it is well known, that he improved his own plough gradually, and by means of repeated experiments; and there is positive evidence, that instead of the Rotherham, the old Scotch plough was the foundation on which he proceeded. Besides the testimony of Lord Kames, to be afterwards quoted, his book-keeper, Hector Heatlie, in a letter to one of the late James Small's sons, states, "That when his father began business at Blackadder Mount in 1763, there was nothing used in Berwickshire but the old Scotch plough; a comparatively very awkward instrument, which went with two oxen and two horses, and indeed often with four oxen and two horses. Your father, observing the faults about her, made and introduced a plough with the broad sock; she was a short little plough, and a wood mould-board, and round in the breast. You know what I mean. The mould-board was round on the top, and not straight, which consequently made her worse to draw. This plough was much esteemed, and she was far easier drawn, and made tolerable neat work, especially on ley ground; but your father did not stop there, but continued to make some additional improvements on her."

Indeed, any mechanic who will take the trouble of examining the beam, the sheath, the handles, the coulter, and the muzzle or bridle of Small's improved plough, with the old Scotch one, will find the parts similar: and Mr Gray, who is so thoroughly acquainted with the construction of ploughs, is of opinion, that the superiority of Small's plough, in a great measure consists in this, that its different parts are made neater and lighter, than in the old Scotch plough, and that these parts are so much better combined together, that the line of traction, and the centre of gravity of the plough, perfectly coincide, the line of draught, (as will appear from the annexed engraving), passing through the centre of resistance.

* There were a few Rotherham ploughs in Scotland at that time; and I am informed that moulds were got by a gentleman in Forfarshire, from a wright at Grindon in Northumberland, who had travelled with Lummas.

Like other ingenious men, James Small was distinguished by simplicity of behaviour, and modesty in his pretensions ; he did not, therefore, bring himself forward, nor do himself that justice to which he was entitled. In the introduction, however, to his treatise on ploughs and wheel-carriages, he states, “ The chief merit I claim in the following sheets is this, that I have given directions by which any sensible workman may be enabled to make a plough *on my principles*,” thus claiming to himself the merit of an improved construction. In that assertion no person ventured to contradict him, whilst he was alive to defend his own pretensions to the credit of his improvements.

In regard to the merits of Mr Small’s plough, they arise from this, that the sock and the mould-board are formed according to strict mechanical principles ; and that those parts which enter the earth, and cut up the furrow, have that equal tapering, or sharpened wedge-like form, which occasions the least resistance in raising the furrow slice. The mould-board, in particular, has that regular curve or twist, which not only lessens friction, in elevating and turning over the furrow slice, but it also places and leaves that slice in the most proper position for the beneficial effects of the atmosphere, and the operations of the harrow*. Small has also the sole merit of inventing and modelling the mould-board, and other parts of the plough, in cast-metal, which contributed so much to the speedy extension of that valuable instrument.

* Mr Kerr considers the peculiar advantages of Small’s plough to arise from this, that at its anterior part it is an exceedingly thin wedge, and therefore cuts the plit from the fast land, with the smallest possible resistance, aided by the broad thin feather of the sock, which cuts off the plit below from the subsoil. The mould-board gradually increasing, the obtusity of the wedge-form gradually turns over the plit in a proper manner, instead of having all its work to do at once, against the whole resistance. It was experimentally proved, before the Dalkeith Farming Society, that Small’s plough, in tearing up old ley, was drawn by a force of from 9 to 10 ewt. while the old Scotch, in the same field, required a force of 16 cwt. to perform the same work, in the same field.

It is a striking proof of the excellence of his plough, that many ploughmen in Berwickshire, for their own ease and satisfaction, offered to be at the sole expence of the wood work, if their masters would supply them with Small's plough, and would defray the other charges of the implement.

The celebrated Henry Home, Lord Kames, who was a friend to merit, and an ardent promoter of agricultural improvements, warmly patronized Small's exertions. In his Gentleman Farmer, 4th edition, chap. I. p. 5, he says, “I boldly recommend a plough introduced into Scotland about twelve years ago, by James Small in Blackadder Mouat, Berwickshire, which is now in great request, and with great reason, *as it avoids all the defects of the Scotch plough;*”—evidently declaring, that the object of Small was, not to bring into use a new plough, but to remedy the defects of the old-established implement of the country; and his sons positively affirm, that during all the period whilst their father was attempting to improve his plough, they never recollect to have heard him mention the Rotherham plough; and they are certain that there never was one of them, either in his manufactory, or on his farm.

In consequence of the great improvements made by James Small on this implement, instead of two or more horses, together with two or more oxen, formerly used, and a driver, Lord Kames had the satisfaction of seeing himself, scarcely a plough with more than two horses and the ploughman, in the lower part of Berwickshire; and he then prophesied, what has since taken place, that the practice would become general. It may be now considered as universally established over all the improved districts of Scotland. The saving thereby made in the expence of cultivation can hardly be calculated.

It was by Lord Kames's encouragement, and at his particular request, that James Small was prevailed upon to draw up a treatise on ploughs and wheel carriages, which was printed after his Lordship's death in 1784. This is certainly one of the best and most useful, as well as one of the earliest publications, on this interesting subject. In that treatise he gives a distinct and scien-

tific account of the principles on which ploughs and wheel carriages ought to be constructed.

When a *Farming Society* was established in Ireland, consisting of the most respectable characters in that spirited and improving country, they ordered this treatise to be reprinted; in consequence of the circulation of which, numbers of Small's improved ploughs were sent to Ireland. The demand became so great, that the society resolved to send over a person to Scotland, (Mr Robert L'Estrange,) to learn the art of making Small's ploughs, and other agricultural implements. With the utmost liberality and public spirit, though attended with much detriment to their own personal interests, every information was most readily given by Alexander Small and Company, who continue their father's profession, that they could possibly furnish; and the society have since erected a manufactory for these implements, under Mr L'Estrange's superintendance, which has spread these ploughs over the greatest part of Ireland. *

It was about the end of the year 1779, or the beginning of the year 1780, that James Small made a pattern in wood for the mould-board, and also for the land-side plates of his plough, and he took them with him to Carron, where he got them cast. They were so well shaped, and answered the purpose so well, that they gave the highest satisfaction both to gentlemen and farmers. Some years afterwards he made another important improvement, that of getting the sheath and head, which were formerly of wood, made of cast-iron, by which they were rendered much less liable to injury; and indeed, when the head formerly gave way, the plough was often rendered useless. The plan of making these parts of the plough of cast metal, was one of the most important improvements ever effected in agricultural machinery; and, without which, Small's plough could never have spread so rapidly as it did over all Scotland. But when plough-makers were thus furnished with the most difficult parts of the plough, according to the most approved models, ready for putting together, the rest of the implement, more especially after Small had explained in his treatise the principles on which it was to be formed, was much more easily constructed.

The difficulties James Small had to contend with to introduce his plough, even in his own neighbourhood, were very great ; of which the following instance is recorded : The late Mr Lumsdaine of Blanerne, was one of the first who ordered the new improved plough ; but his servants did all they could to prejudice their master against it, pretending it did not go well, &c. Small was then obliged to appear in the field himself ; and taking the plough into his own hand, he proved to Mr Lumsdaine, and all his ploughmen, how well it could work. Had he not been a good ploughman, as well as an able mechanic, he could not have thus triumphed over those who opposed the introduction of his improvements.

Having established his plough in Berwickshire, Small wished to introduce it into Mid-Lothian, where it had met with much opposition ; but being confident of the superiority of his invention, he offered to make a comparative trial. In consequence of that challenge, competition of ploughs took place in a field near Dalkeith, in presence of many gentlemen and farmers from Berwickshire, Mid-Lothian, East-Lothian, &c. A number of ploughs were brought forward, as the old Scotch plough ; several English ploughs ; a plough by Mr Hutchinson with an iron wheel, &c. ; but Small's was successful, the judges having decided, that it did the best work, and was considerably lighter in the draught, than any of the others. In consequence of the success of his plough at this public trial, it spread rapidly over all the different counties in Scotland, and has since been adopted in many parts of England, Wales, and Ireland, and in many foreign countries.

Small's plough has likewise been successful in many other competitions, in England and in Ireland, as well as in Scotland, which it is unnecessary here to detail.

It is proper, also, to remark, that he made several improvements in other agricultural implements besides the plough ; as in harrows, rollers, winnowing machines, and wheel carriages.

It was a rule with James Small, that whatever piece of work he undertook, whether the making of a cart or plough, or any other implement, it should be made complete ; and so anxious was he, that his implements should give perfect satisfaction, that rather than suffer any insufficient work to be sent from his ma-

nufactory, he would break it to pieces, whatever loss he might thereby sustain.

There was nothing, however, by which he was more distinguished, than by his zeal to promote useful improvements in the department of agriculture.

One who knew him well, (Hector Heatlie, formerly his book-keeper, and now resident in Dunse,) affirms, “that to serve his country in the line of his profession was his incessant object; and to which he had so great a propensity, that to it he sacrificed his ease, his health, his strength, and his substance.” Had it not been for this turn of mind, James Small might have left behind him a competence for his family; but instead of thinking of his pecuniary concerns, he was constantly trying experiments, and making improvements in machinery. When his ploughs were sent to any distance, he was often under the necessity of attending to see them tried, and to refute any objections that might be made to them. This occasioned not only much loss of time, but expence. He also lost considerably by publishing his Treatise on Ploughs and Wheel-cartages, which enabled others to rival him in that branch of business. In fact, he had such a propensity to be useful, that he laid personal interest too much aside. He had the satisfaction, however, of performing services to his country, to which I have endeavoured to do justice, from information, the authenticity of which may be relied on, and to leave a character behind him, which will long be remembered with respect. By him an implement was constructed, which has materially diminished the expence of cultivation, which will answer in every soil, which will turn out the cleanest and deepest furrow with the least force of draught, and which, on the whole, is better adapted, *for general purposes*, than any plough that has hitherto been seen or heard of*.”

* That intelligent practical farmer, Robert Brown, Esq. of Markle, in his recent treatise on Rural Affairs, vol. I, p. 236, remarks, that under a parity of circumstances, the swing plough brought into practice, and afterwards improved by Mr Small, is fitted for executing work to better purpose, than any other of the numerous varieties of that implement employed in the several districts of Great Britain.

It would appear that the great Earl of Stair had established a manufac-

James Small died in the year 1793, about the 53d year of his age. Of him it may be safely affirmed, that a man possessed of more public zeal, and of a greater turn for mechanical inventions, has rarely appeared in any age or country.

Description of Small's Plough.

In order that the reader, who may not have seen this plough, may be enabled to form a just conception of its construction, an engraving is annexed, which will be perfectly intelligible, with the aid of the following references :

Reference to the engraving of Small's Plough.

FIG. 1. The left-hand, or land side of its wooden frame.

A, B, represents the beam; C, D, the sheath fixed into the beam at D; and its lower end C, serves for the sock or share to be fixed upon.

E, F, the left hand or larger handle, placed upon the beam at B, and the lower end is fastened to the sheath at E, by which the sheath is supported against the resistance that the sock is exposed to in passing through the ground. There is also an iron bolt goes up through the frame at E, and is secured by a screw nut on the upper side of the beam; by this means the beam, the larger handle, and the sheath, are kept firm together.

FIG. 2. Plan, or bird's-eye view of this machine.

A, B, the beam; B, C, the larger handle; D, E, the right-hand or lesser handle, attached to the larger one by the iron rod F, and the wooden roundels G, H.

ture of ploughs, and other agricultural implements, which reflects great credit on his memory, without detracting from the merits of James Small.

FIG. 3. *The land, or left-hand side of the plough when completed.*

A, B, the beam ; B, C, the larger handle ; E, F, the coulter fixed into the beam at F.
 G, H, I, the sock or share, placed upon the lower end of the sheath.
 H, K, L, M, are plates of cast-iron, nailed upon the land side of the plough, to prevent the wood from wearing, by rubbing on the firm land.
 L, M, the hindermost end of the mould-board.

FIG. 4. *The right-hand, or furrow side of the plough.*

A, B, the lesser handle ; B, C, the beam ; D, E, the bridle or muzzle, placed upon two iron bolts which pass through holes in its arms, and the fore part of the beam ; E, F, the chain, and swing or cross-trees to which the horses are yoked.
 G, H, the coulter ; K, H, I, the share ; L, M, N, I, the mould-board ; its fore part, M, I, is fastened to the sheath, and its back part fixed on the lesser handle.

FIG. 5. *The upper side of the plough ready for working.*

A, B, represent the larger handle ; B, C, the beam ; D, E, the bridle, having a few holes in its fore part by which the draught-chain can be shifted a little to either side, and cause the plough take a broad or narrow furrow slice, as may be found necessary. In the cross D, are also several holes, by which the depth of the furrow can be regulated, by shifting the bolt that passes through the cross D, and the beam.
 E, F, the chain, and swing-trees, to which the horses are attached when ploughing.
 G, H, the lesser handle ; I, H, K, L, the mould-board ; L, M, the fine or feather of the share.

FIG. 6. *The under side of the plough.*

A, B, the larger handle ; B, C, the beam ; D, E, the lesser handle ; E, F, G, the share ; G, H, the sole ; and I, E, K, L, the mould-board.

In regard to the weight of Small's plough, it varies from 134 to 141 lbs. English, but when the chain is added, it amounts even to 162 lbs. A set of drawing-bars, or *horse-trees*, as they are sometimes called, weighs from 20 to 21 lbs. more. The price of the plough is L3, 12s. and of the drawing-bars 12s. or L.4, 4s. in all; so that it unites the advantages of strength and cheapness, and is at the same time much lighter than many other ploughs.

Alexander Small and Company, the sons of this ingenious mechanic, have lately reduced the weight of the plough considerably, for light land, (from 141 to 105 lbs.); so that it will suit a single horse, of a strong make, or a pair of small horses. The price is also diminished from L.4, 4s. to L.3, 10s. Their manufacture is carried on at Leith Walk, near Edinburgh; where those who may wish to encourage ingenuity, may be furnished with ploughs and other instruments of husbandry, of the best construction.

As unfortunately they are deficient in capital, at least for any extensive undertaking, it is proposed, that a sum of money shall be raised by subscription, under the patronage of the Highland Society of Scotland, the Farming Society of Ireland, and other public-spirited institutions, to enable them to carry on their business, to the extent to which their father's services to the country, and their own ingenuity and merit, would procure them a demand.

*Charlotte Square,
Edin. 19th December, 1811.* }

No. VI.

DESCRIPTION OF A MACHINE FOR DRESSING (HUMBLING) BARLEY OR BEAR*.

References to the Plan.

FIG. I. A B C D E F represent the framing that carries the wheels and scutching apparatus. G G G G, a hollow cylinder of wood or cast metal, into which the bear or barley is conveyed from the hopper K.

H H represent a wheel fixed upon an iron axle or spindle, placed perpendicular in the centre of the cylinder G, and upon this spindle is also fastened the scutchers I I I; so that when the wheel H is turned by the wheel N N, which is fixed upon one end of the horizontal axle M, and on the other end of this axle is also placed the wheel O O, this wheel being attached to a threshing machine, or any other engine, by which means motion may be conveyed to the scutching arms I, which revolve in cylinder G, and clear the grain of the beards or awns, as it passes down through among the scutchers placed on the spindle, (see E F, G H, and I K, in fig. III.).

P P the cross-rail, in which the upper pivot S of the perpendicular axle turns. L, a pout or opening, that allows the grain to issue out of the machine, when completely humbled, or the beards wholly cut off.

FIG. II. Elevation of this machine, wherein A B C D represent the frame that supports the different parts of the machinery.

* The merit of this invention is disputed.

MACHINE FOR DRESSING BARLEY or BEAR

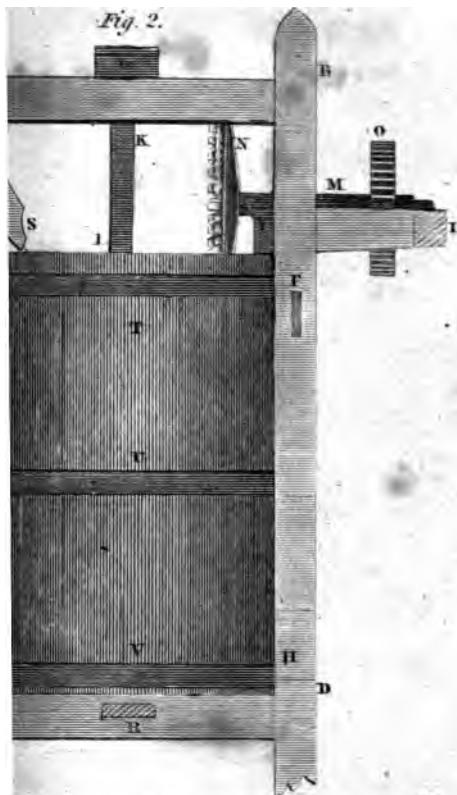
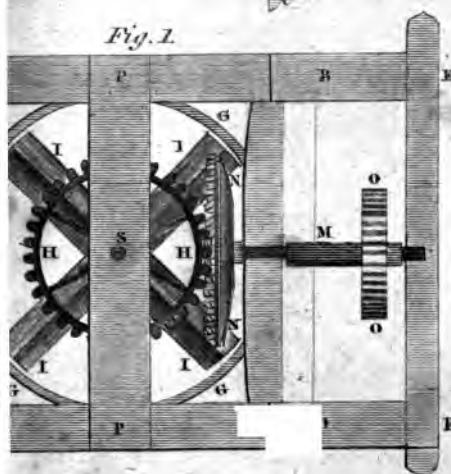


Fig. 1.



Scale of Feet

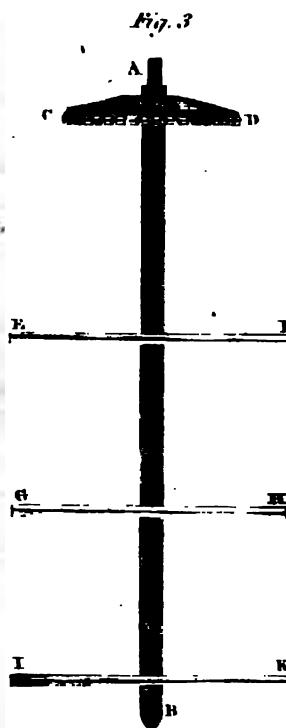


Fig. 4

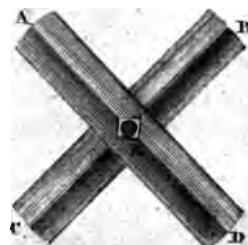
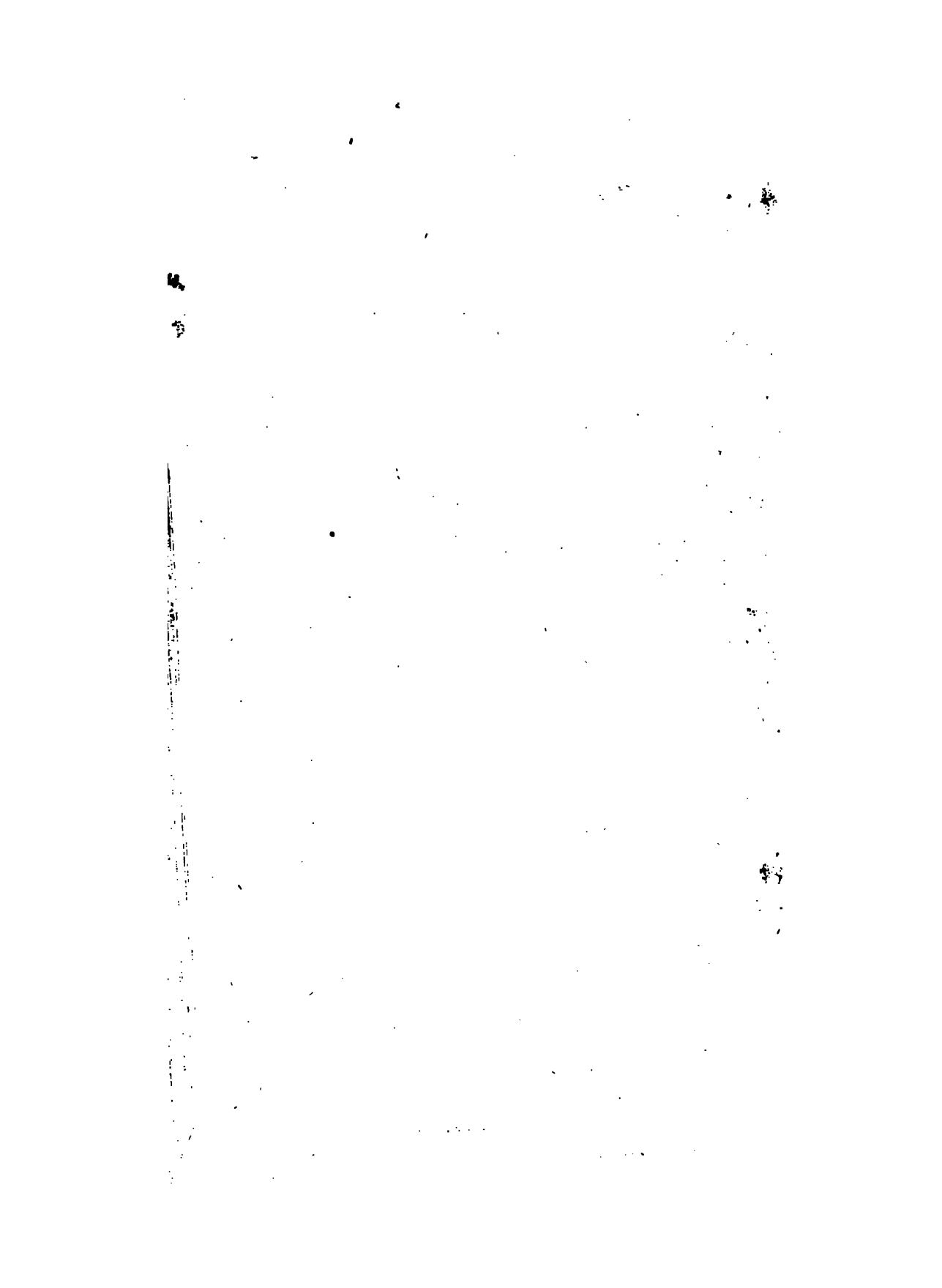


Fig. 3.



E F G H the tube or receptacle into which the bear or barley passes through the spout R S, from a hopper above the machine.

T U V are hoops of iron to hold the tube firmly together.
I K the perpendicular spindle on which the scutchers and horizontal wheel are fixed, (see C D in Fig. III.). M represents an iron axle, upon which are fixed the wheels N and O, that convey motion from the threshing-machine to the scutchers. L Y are beaters, in which the pivots of the horizontal spindle M turns. R a rail, that the foot of the spindle or axle I K turns. Z a spout or opening, through which the grain runs from the scutchers or beaters.

FIG. III. A B represent the spindle, on which are fixed the wheel C D, and also the scutchers E F, G H, and I K; these scutchers, revolving in the tube at about two thousand feet in the minute, detach the beard or awns from the bear completely.

FIG. IV. A B C D represent one of the beaters, and E the axle on which it is fixed; a greater number of scutchers may be placed upon this axle if found necessary.

FIG. V. An end view of one scatcher; its edges F G should be a little rounded, to prevent them from cutting the bear or barley in the operation of humbling.

This useful machine has been attached to many threshing-mills; and it has been found to answer the intended purpose so well, that it is recommended by those gentlemen who have applied it, as a very great improvement. There must be some additional stress on the power by which it is turned; but by experience it is found to be so trifling, that this machine may be added to any threshing-mill, whether driven by water, by wind, or even by horses, or oxen.

No. VII.

ON THE MANUFACTURE OF POT, OR PEARL BARLEY.

Pot, or pearl barley, should never be manufactured from grain weighing less than sixteen stones *per boll*, (nearly six Winchester bushels), and particular care is requisite in selecting the grain, so that it be plump, well filled, and of equal size.

Grain of sixteen stones weight is generally reduced, when common barley is the object, to from eleven to twelve stones, and proportionably lower for fine. The expence of making pot barley, in general, is at the rate of 2s. 6d. *per boll*, and the dust or refuse, which is always retained, is commonly valued at that sum. It is excellent food for horses, for cows, (more especially if boiled), and for hogs.

The process of making pot barley is as follows: After kiln-drying the barley, it is put into the mill, and rough hulled, which may be done in about fifteen minutes; if the mill is in good order, and wrought by a proper hand, twenty bolls (120 Winchester bushels) may be put through it in eleven or twelve hours. This quantity is laid in the trough or floor, as it comes from the cases, and made a little damp; it is kept in this state about forty-eight hours; and if not made very fine, the same quantity may be again completely finished in eleven or twelve hours.

Next to wheat, barley is the grain the best adapted for making bread, but it is attended with two great inconveniences; 1. It has a coarse outer husk, of which wheat is naturally divested; and, 2. It has a dark inner husk, of so delicate a texture, that, when ground with the flour, it can never afterwards be extracted, by bolting or any other contrivance. It is principally this dark

IRON PLOUGH and MACHINE for MAKING POT MARLEY.

~~To be placed opposite the Appendix page 50.~~

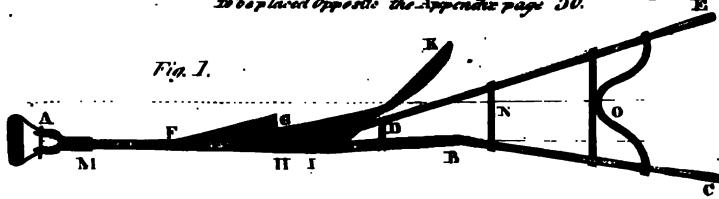


Fig. 1.

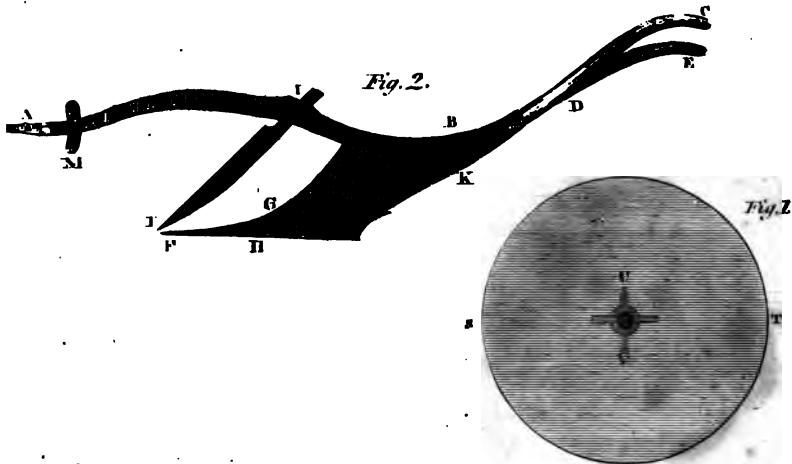


Fig. 2.

Fig. 2

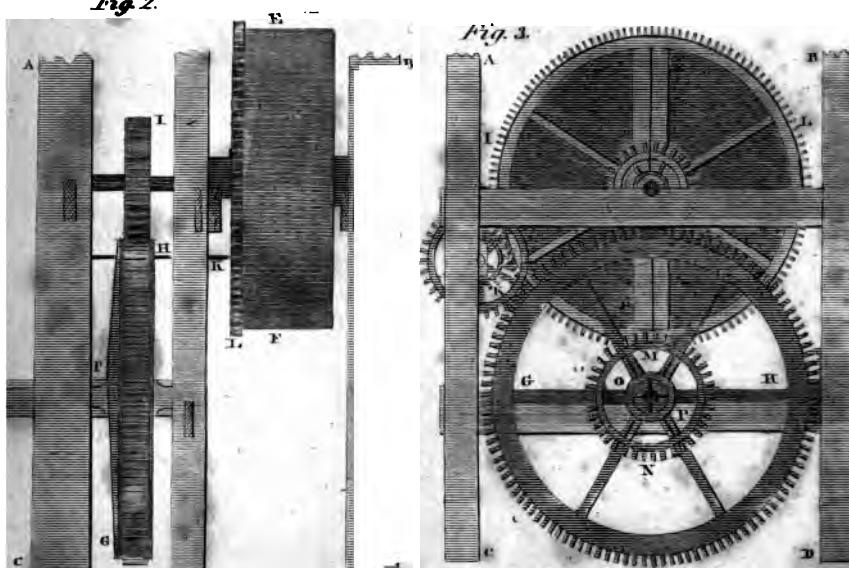
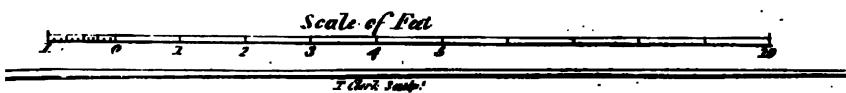


Fig. 2.

Fig. 3





Inner husk which makes the barley bread so dark-coloured and unpalatable.

When pot or pearl barley is made, both these husks are taken off; and when flour or meal is manufactured from pot or pearl barley, it resembles much wheat flour. It may be made by itself into excellent cakes, which some from its lightness prefer to any other sort of bread. Mixed with wheat flour, in various proportions, as one-fourth, or even one-third, it makes as good loaf bread as any one could desire.

The following statement will explain the saving which would thence arise, *per* quatern loaf, and *per* sack.

20 English stones, of 14 lbs. avoirdupois each, or $\frac{1}{3}$ **make a**
16 Dutch stones of 17 $\frac{1}{2}$ lbs. avoirdupois, each, $\frac{1}{3}$ **load.**

A load is equal to an English sack, each $\frac{1}{3}$ **280 English pounds**
weighing 2 cwt. 2 qrs. or - $\frac{1}{3}$ **avoirdupois.**

A sack of flour will produce, on an average, twenty
peck loaves, each weighing 17 lbs. 6 oz. avoirdupois. Lbs. Oz.
Total product of a sack, - - - - - **346 6**
Deduct the weight of a sack of flour, - - - - - **280 0**

Increased by the addition of water and yeast, &c. **66 6**

15 Dutch stones of flour (from wheat), at 5s. per
stone, - - - - - **L.4 0 0**

Hence, the peck loaf 4s.
— the quatern loaf 1s.

10 $\frac{1}{3}$ Dutch stones of wheat flour at 5s. - - - **L.2 13 4**
5 $\frac{1}{3}$ Do do, of barley flour at 3s. the price at
which it can be furnished, - - - **0 16 0**

L.5 9 4

Hence, the peck loaf 3s. 5 $\frac{1}{3}$ d.
— the quatern loaf 10 $\frac{1}{3}$ d.

Saving by the use of one-third barley flour, per quart
tern loaf, 1 $\frac{1}{2}$ d.

Saved by mixing the barley flour with wheat, on each
sack, L.0 10 8

If the price of wheat flour rises, the saving will increase, as the
price of barley will not probably rise in the same proportion.

N. B.—There is an allowance to the baker of 1s. 6d. per
bushel, which would make about one penny addition to the price
of the quartern loaf.

Description of a Machine for making Pot or Pearl Barley.)

FIG. 1. represents the mill-stone, and U V an iron cross or rind,
by which it is fixed upon the spindle or axle, (See R in
fig. 4).

FIG. 2. A B C D represent the frame and bearers which support
the machinery.

E F, the case or curb that incloses the mill-stone, and being
covered with sheet iron, in which are small holes, to allow the
refuse or dust to escape, while the barley is retained within
the case E F, in which the mill-stone moves with considerable
velocity.

M N represent a wheel fixed on the scale, O P; this wheel may
be driven by any machine having power to turn the barley
mill-stone with its case. G H represent a wheel, also fixed
upon the axle O P, by which wheel the pinion H I is driven;
this pinion being fixed upon the iron-axle spindle R. Upon
this spindle is also fastened the mill-stone, and by this means,
driven within the case or curb with considerable velocity. K
represents the small wheels that are driven by the wheel G H,
to turn the case or curb E F, by acting on the wheel L L,
which wheel is fastened upon the case. This case is made so
as to be quickly taken separate in the middle, in order that it
may easily be put on, or taken off, from the mill-stone, at any
time when necessary.

No. VIII.

ACCOUNT OF SEA-WEED BEING EXHIBITED TO COWS BY WAY OF CONDIMENT.

COMMUNICATED BY MR JOHN SHIRREFF, ABBEY-HILL.

MR MACCALLUM, south side of the Grassmarket, opposite to the Corn-stand, keeps about twenty milch cows, which he feeds on grass in summer, and always on grains (in Edinburgh called draf) in winter. He also gives them distillers' dreg or lees for drink, in that season when he can get it, which is at all times when distillation goes on. His cows likewise get some turnip once a day in winter and spring, and sometimes twice; not so much for food, as for a condiment, or, as he says, *a medicine*. And when turnip are very scarce, and high priced, he gives sea-weed in lieu of them, particularly in the months of February, March, and April. This he gets on the Black Rocks, near Leith, at spring-tides only, so that he keeps some of it for two weeks. There are two species used, the *fucus digitatus*, and the *fucus serratus*. He does not use the *F. resiculosus*, lest it fill the cows too full of *wind*, meaning air. Mr Maccallum begins by parboiling the sea-weed, and giving the cows a little of the water it has been boiled in. When they drink the water, they are then offered some of the parboiled weed itself; and when they eat it parboiled, it is gradually exhibited to them raw. He gives each cow, once or twice a day, as much as a person can neatly carry, at once, between his two hands. These marine plants operate as a gentle laxative, and Mr M. thinks the use of them promotes the health of his cows, and consequently adds to the quantity of milk they yield.

N. B.—The cow-feeders about Edinburgh frequently sell their milk to retailers, at a certain sum weekly; in some cases as high as a guinea *per week*. Whenever the cow begins to fall off in milking, she is disposed of, and another purchased; and she is usually in such good condition, that the price she sells for buys her substitute.

No. IX.

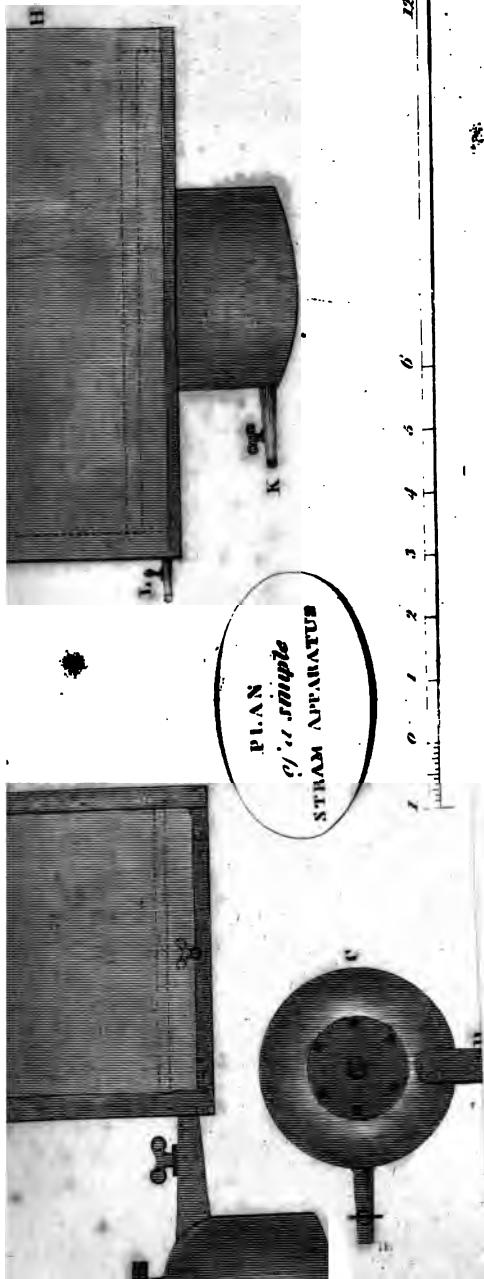
ACCOUNT OF A SIMPLE STEAMING APPARATUS FOR COOKING ROOTS OR OTHER FODDER FOR LIVE STOCK, WITH A DRAWING, EX- PLAINING THE NATURE OF THE PROPOSED APPARATUS.

BY MR JOHN SHIRREFF, ABBEY-HILL.

THE chief advantage attending the use of the apparatus about to be described, consists in saving labour and time in lifting off and on the tubs or casks for holding the materials to be steamed, also the expence of cost and repairs of leaden pipes, cocks, &c. Its superiority over those commonly used, particularly in a large operation, will be at once perceived by those who have paid attention to the subject.

The boiler may be of any approved form, and of a size proportioned to that of the box, with a furnace of that construction which affords the greatest quantity of heat to the boiler, with the smallest waste of fuel. The box may be made of stout pine plank, well jointed together. One of eight feet in length, five feet wide, and three deep, will serve for cooking potatoes, in the space of one hour, sufficient to feed fifty large milch cows for twenty-four hours.

The box should stand within a few feet of the boiler, with its side parallel to it, either on a piece of solid building, or on six or



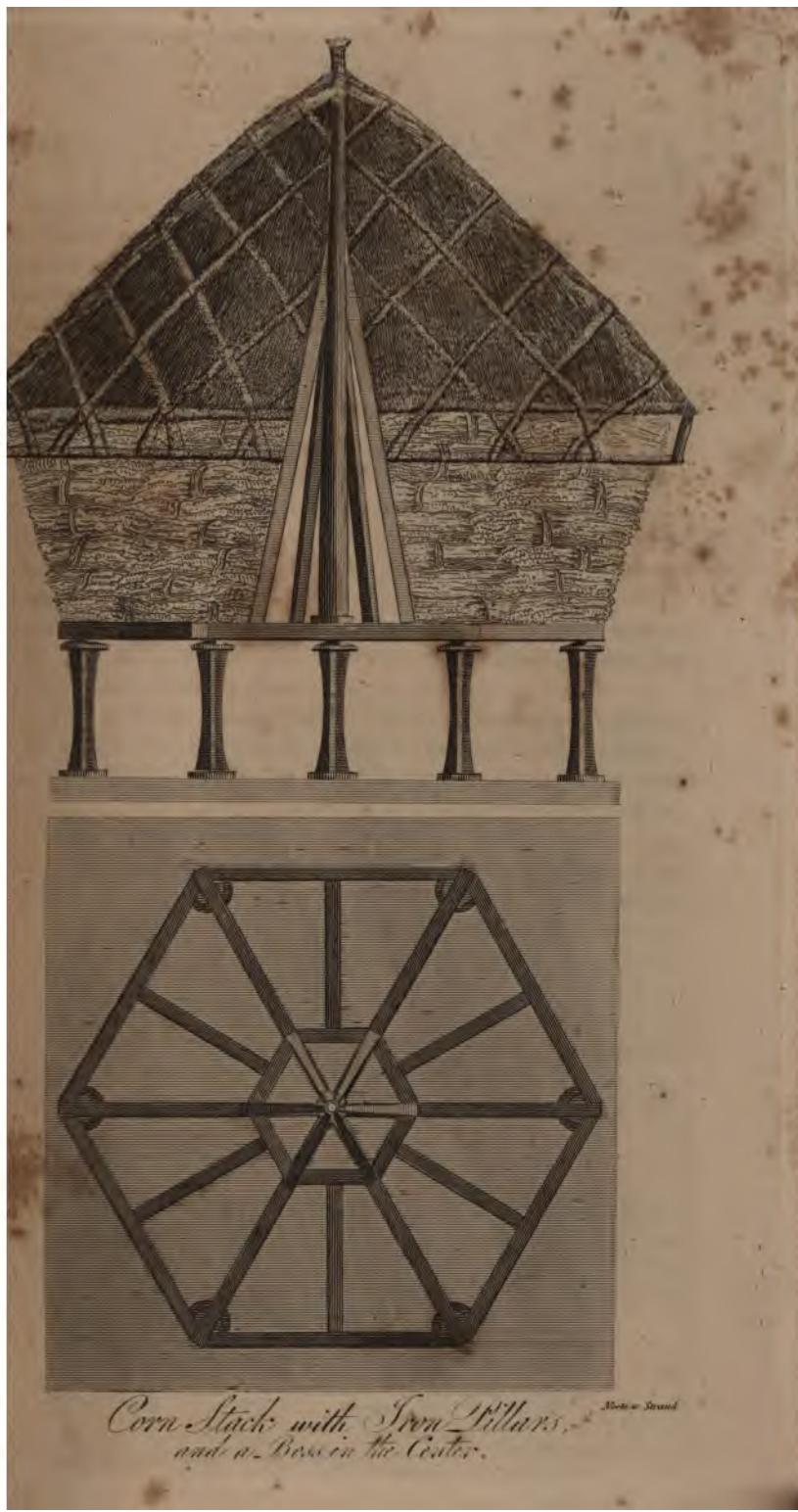
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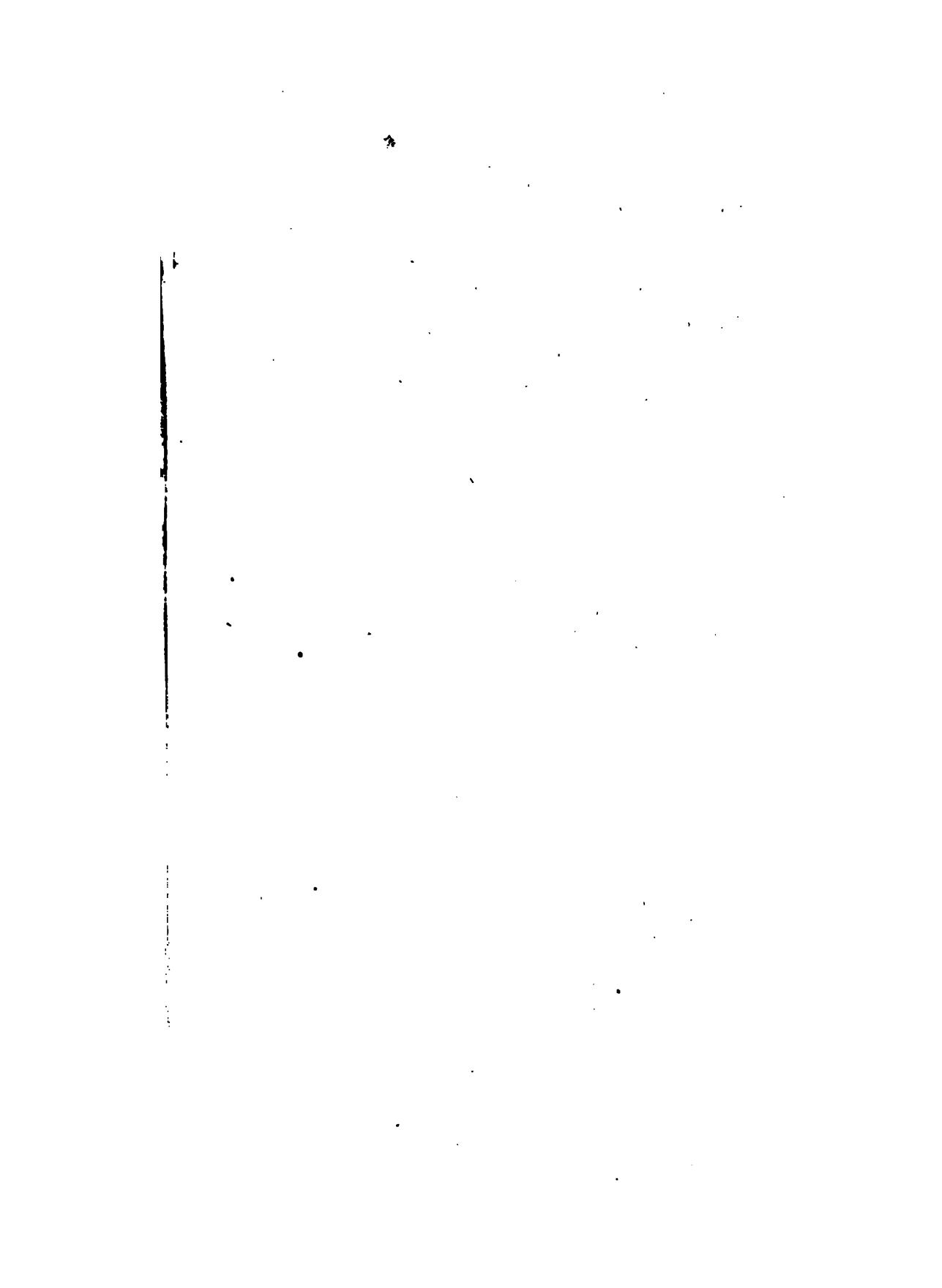
more posts. It must have a porous bottom, with a close one about a foot below it. From the upper part of the boiler, a pipe of wood, or any other suitable substance, proceeds, and enters into the box about the middle of it, between the false and solid bottoms, conducting the steam into the space between them; which, penetrating through the holes or grating of the false bottom, rises upwards, and mixes with the contents of the box, while the condensed steam, and any liquid matter that may ooze out of the materials, drips through the apertures, and lodges on the solid bottom below, from whence it can be let off by a cock fitted to it for that purpose. There is an opening in the upper part of the box, two feet square, shut by a lid that moves on hinges. This lid is kept down by its own weight only, and acts as a safety valve to the box and boiler also, from the connection between them, though the boiler may be accommodated with a separate safety valve if thought necessary. When the force of the steam is very great, the lid is lifted up, and a quantity escapes into the atmosphere, and the lid then falls down again of its own accord. This aperture is made so large, that it may be used to fill the box with whatever material is intended to be steamed. One end of the box must be accommodated with a door, which must fit close, and be secured firm, while the operation of steaming goes on, but must admit of being opened to one side, when the business of cooking is finished, to allow the cooked contents of the box to be drawn out by a solid iron rake, into a large trough placed immediately below to receive them. From the ignorance and carelessness of servants, in managing fire in the furnace, the bottoms of cast-iron boilers are sometimes fused, especially if the water in the boiler be allowed to get too low; and, again, if the boiler be too suddenly supplied with water, when red hot, it will crack. To prevent these accidents, the bottom of the boiler has been cut out, and its place supplied with broad plates of malleable iron lapped over each other, and clinched to the cast-iron sides of the boiler. But all risk of either fusing or cracking would be prevented, by supplying the boiler gradually with water from a cistern, in the manner it is furnished to the boilers of steam-engines.

The boiler may also be equipped with two cocks, attached to pipes of different lengths, to determine, at any time, whether the boiler has too much or too little water in it, though there will hardly be any occasion for these; because, if the valve or lid hanging on the aperture at the bottom of the cistern, and the stone suspended on the surface of the water in the boiler, be in due equilibrium, the quantity of water in the boiler must always be the same, while there is a sufficient quantity in the cistern to supply the waste from evaporation in the boiler.

It might be an improvement, to have the top of the box made to lift off and on, for the purpose of filling it more conveniently with the materials to be steamed: Also to have divisions to slide out and in, to contract the space in the box, to suit a smaller quantity of materials that might at any time be required to be steamed. These sliding divisions would, each in their turn, become the top of the box, and would each require to have the lid moveable on hinges accordingly. It would greatly expedite the business, if a crane were used for lifting the potatoes from the washing-machine, and depositing them on a barred platform to drip. This platform might be placed near to the box, above it somewhat, and projecting over it a little withal, so that when enough of potatoes shall have been washed, the whole might be tumbled into the box at once, by raising the opposite side of the platform.



*Corn Stack with Iron Pillars,
and a Base in the Center.*



No. X.

COMPARISON BETWEEN THE ADVANTAGES OF FEEDING CATTLE WITH POTATOES AND TURNIPS.

BY ROBERT SPEARS, ESQ. OF KIRKMAX, DYSART, FIFE.

THE average produce of potatoes may be taken at 40 bolls, 4 cwt. per boll, or 8 tons, per Scotch acre. Mr Spears has had 55 bolls per acre.

The average of an acre of turnips, in fertile soils, and under a good system of management, may be stated at about 85 tons.

One acre of turnips will keep the same number of cattle three months, which an acre of potatoes will keep only about from six weeks to two months, giving the cattle as many of each article as they will eat; but still the cattle will fatten fully more on potatoes in two months, than on turnips in three. By far the best way, however, is to feed with both at the same time: in this way the cattle require no water, which they do when fed with potatoes alone*; and when kept close on the latter, they are apt occasionally to loath their food, which is never the case when fed with part of each. It is of great importance to have potatoes always at command, particularly in the event of a severe storm, or if cattle are kept on in a fattening state, late in the spring,

* Mr John Shirreff remarks, in regard to no water being required, that that only saves the trouble of giving it, which will always be compensated with the chance of its being wanted, which is often the case than is commonly imagined. Besides, the water will add to the urine, which is the *prime mobile* in converting straw into manure.

when turnips will have run to seed, and when no ruta baga can be had. Both impoverish the soil when kept too long in it, and become very indifferent feeding. The following mode of feeding has been practised by a brother of Mr Spears's, who is an extensive farmer, and who has at present a number of cattle feeding according to that plan. By seven in the morning, (against which time they are all properly cleaned out), every pair of cattle get one peck and a half of potatoes raw. As soon as these are eaten up, they get as many turnips as they will eat, and then some straw, of which they only eat a small quantity: all this is over by ten o'clock, when the doors of the place where they are kept are shut, and the cattle allowed to remain quiet till two in the afternoon, when the same mode of feeding again takes place, and by five o'clock they are littered up for the night. With this mode of feeding, they are growing to fat and weight in a most wonderful manner.

The quantity of manure from the potatoes and turnips will be nearly the same, but that from the potatoe feed will be the strongest. In fact, the richness of dung is regulated by the quality of the article from which it is produced.

The kinds of potatoes mostly used in the neighbourhood of Dysart, are called Dons and Shanwell Red, said to have been lately imported from Ireland by Dr Coventry. In deepish loam, and when the season is not over dry, the red produce a very great crop, and are a solid good potatoe, but they don't do so well in lightish dry soils.

The Swedish turnips have been only very partially tried in this quarter of the kingdom. The general opinion regarding them is, that they are fully as valuable as potatoes; but it is a just objection to their being extensively cultivated, that they require an additional quantity of manure, and are of a more scourging nature for the soil. They will only thrive also in a very fine loam. The potatoes have likewise this great advantage, that they are generally out of the ground in full time for ensuring a good crop of winter wheat; whereas, after Swedish turnips, the ground can only be prepared for a barley or an oat crop, unless the crop is taken up and stored. Mr Spears's brother raises the greater part

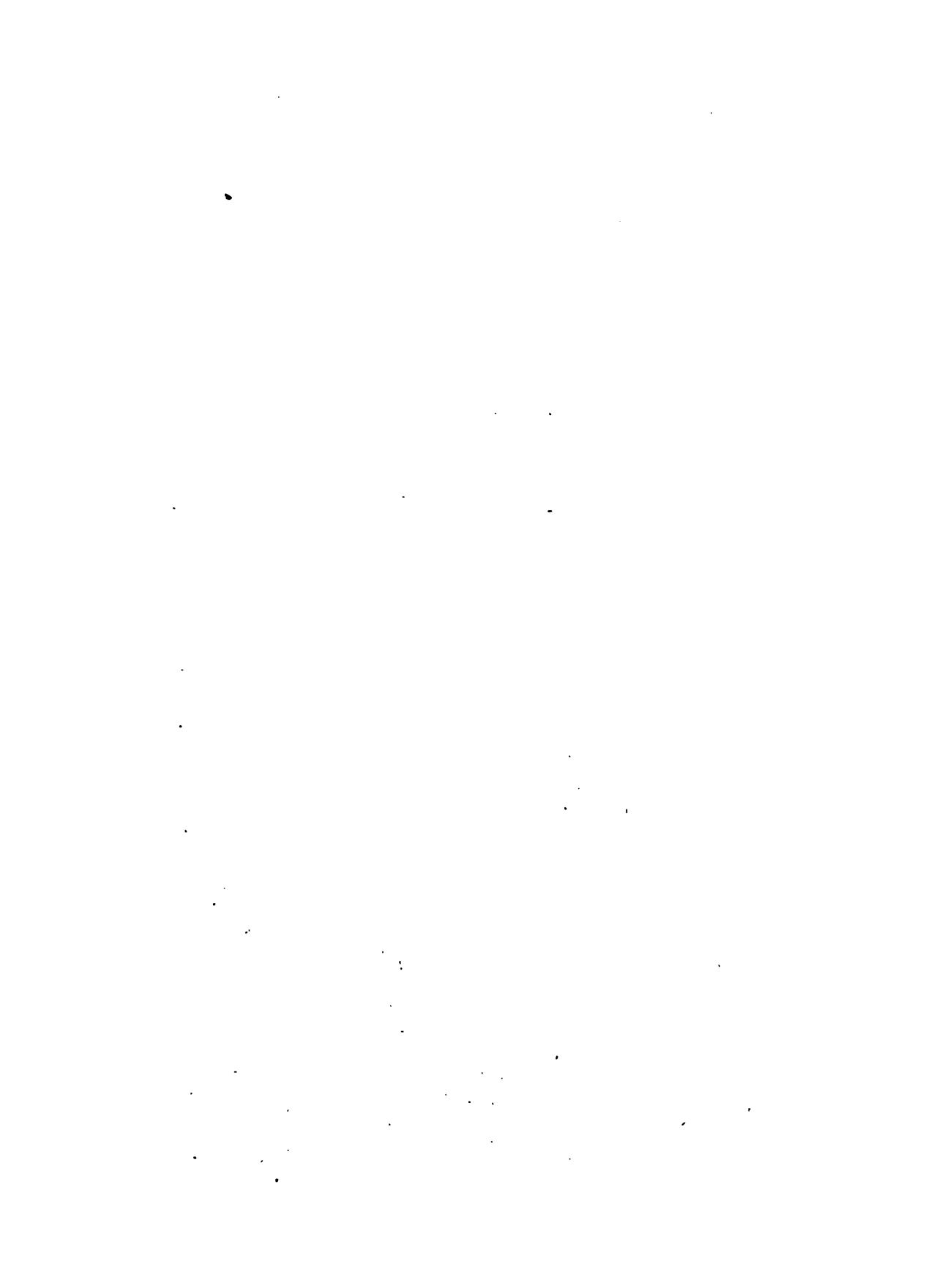


Fig. 1.

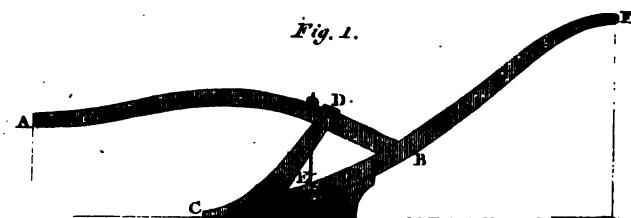


Fig. 2.

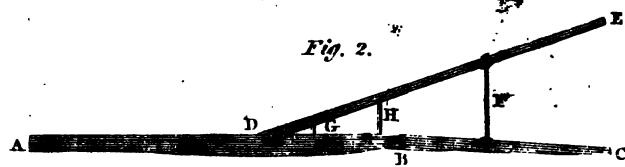
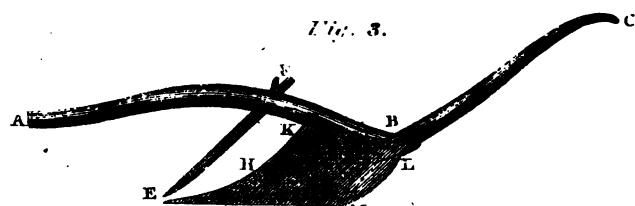
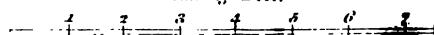


Fig. 3.



Scale of Feet.



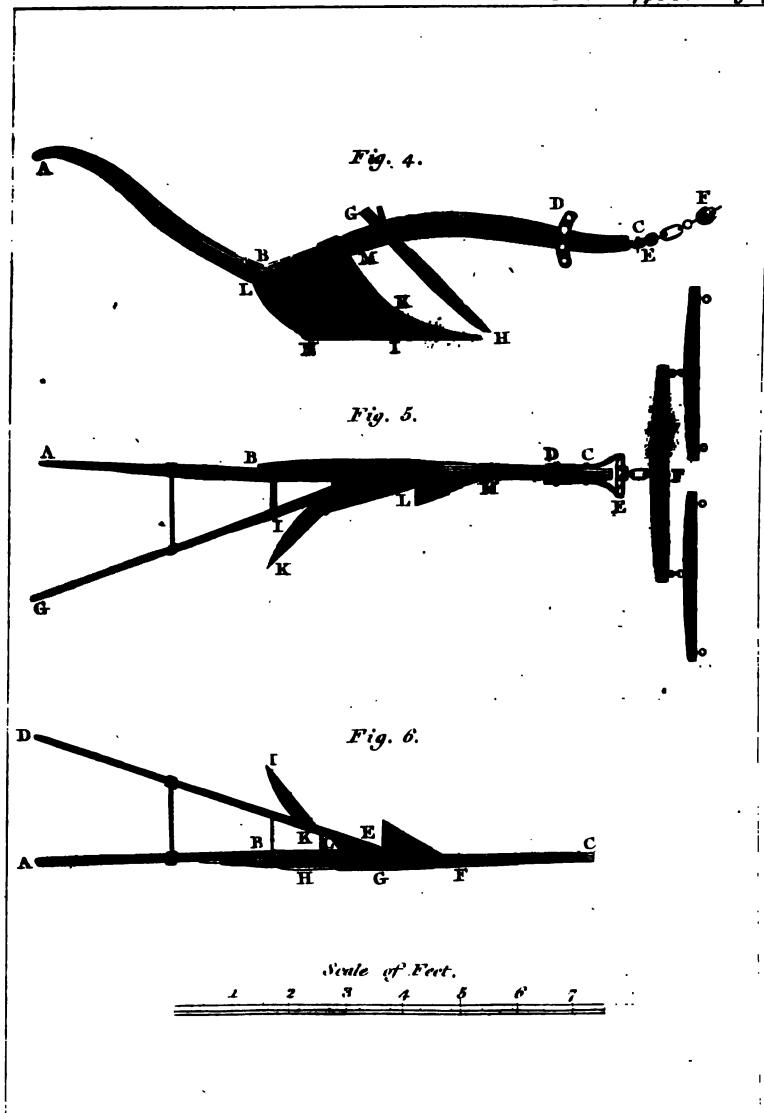
To face 83

Smalls or the Switch

Improved Plough

Andrew Gray





Smalls or the Scotch
Improved Plough.
Andrew Green

of his wheat crop after potatoes, and has nearly the same return as after summer-fallow; a certain proportion of which, however, he always finds it necessary to have on strong soils. Indeed, every farmer, occupying a heavy soil, will find it for his interest to summer-fallow regularly his land for wheat, as there is no other management by which such soil will turn out so much to his advantage.

No. XI.

ON THE CULTURE OF RAPE, INSTEAD OF A SUMMER-FALLOW ON THIN CLAY SOILS.

BY GEORGE CULLEY, ESQ.*.

RAPE may be sown from the 24th of May to the 8th of June; but comes to the greatest growth if sown in May. If sown earlier, it is apt to run to seed. From two to three pounds of seed is required *per acre*, sown by a common turnip-seed drill. But as rape-seed is so much larger than turnip-seed, the drill should be wider. When hoed, the rape should be set out at some distance as turnip plants. The drills should be from 26 to 28 or 30 inches, according to the quantity of dung given. As many ploughings, harrowings, and rollings, &c. should be given, as may be necessary to make that kind of poor soil as fine as possible, and cleared of twitch, &c.: the produce will be from 25 to even 50 ton *per*

* There is a short account of this process already given in vol. i. chap. 2. sect. 4. § 7. with some observations on the propriety of adopting it, on farms consisting entirely of clay. In particular cases, as appears from Mr Culley's most respectable authority, such a plan must be attended with great advantage; but it does not seem applicable to general use.

acre or upwards. But it is not so much the value of the green crop, (although the better the green crop, the better will the wheat be), as the great certainty of a valuable crop of wheat, that merits attention. The sheep are put on from the beginning to the middle of August; they must have the rape consumed by the middle, or at latest by the end of September, so that the wheat may be got sown, on such poor damp soils, before the autumnal rains take place. The number of sheep must depend upon the goodness or badness of the crop. But as many sheep must be employed as to eat the rape, by the middle of September, or end of that month at the latest, for the reasons formerly given. The Burwell red wheat, (so called from a village in Cambridgeshire), is always preferred. Poor clays will not allow deep ploughing, consequently that operation must be governed by the depth of the soil. The land must be made as clean as any naked fallow*. There is scarcely an instance known of a crop of wheat, sown after rape, and eat off with sheep, being mildewed; and the grain is generally well perfected. Mr Culley has known a crop of wheat after rape, upon a poor muirish thin clay soil, worth much more than the fee-simple of the land that produced it. He has frequently known land, both after rape and after naked fallow, in the same field; and invariably the rape wheat was better in every respect, than that after naked fallow.

* This can hardly be done without the aid of a powerful scarifier.

No. XII.

FARTHER INFORMATION FROM WILLIAM HUNTER, ESQ. OF TYNEFIELD, REGARDING THE EXPERIMENT HE TRIED OF FOLDING SHEEP, AND FEEDING THEM WITH TURNIPS.

THE number of acres of turnips, given to the 300 sheep, were from 20 to 22, and the average produce, from 42 to 45 tons per Scotch acre, tops included. The quantity of straw used, was nearly as follows: 1. The straw of about 75 Scotch acres, the preceding crop of wheat, which had been stacked on purpose for the experiment, say 130 stone iron per acre, or 26 cwt.; and the like quantity of the crop of the year in which the experiment was made. The sheep were folded the last week of October and first of November; they were sold in March, and the last of them were sent off in the first or second week of April, so that they were about five months in the fold. During the wet months of November, December, and January, any quantity of litter may be thrown in, but regard must be had to proportion it, on the whole, to the droppings from the sheep, as in case of there not being enough of droppings disposed in the mass, the fermentation wanted, when put into the dunghill at the end of the season, will not be strong enough. Where saving of straw is an object, a covered pen will be required. Mr Hunter's object was to get as much straw converted into good manure as he could. The manure was given to about 51 or 52 Scotch acres; but had he been aware of its powers, it might have gone farther. In regard to the value of the manure, it may be observed, that manure got at Dunbar, the nearest place where it can be had, but five miles from the farm, costs, carriage, &c. included, 8s. or 9s. per ton.

It is proper, however, to remark, that the above quantity of straw and weight of turnip, would have produced a very considerable weight of manure used in the ordinary way; but the sheep eat much less of the straw than cattle, in proportion to their weight, and the manure produced is very superior to any that he ever had on his farm.

Last year, (1811), Mr Hunter's sheep, (ten score), were kept in the straw fold, and fetched 2s. *per head* more than those in the field, sold the two following weeks after the former were disposed of. This might in some measure depend on the state of the market at the time, but the sheep in the fold were fatter than the others. Had it been otherwise, and had they even sold for 2s. less, he would not have inclined to drop the plan of making so much straw into the best of manure. He has always as many sheep in the fold as he can spare litter for. This year he bought upwards of fifty small Highland cattle, worth only L.4, 7s. each, which he is soiling in the turnip field, in the same way as the sheep. They are thriving apace. He proposes to keep them there on turnip until the clover is fit to cut, and he will send them to another farm to be soiled, having little clover on the farm where he resides; he is reserving straw for the purpose. By summer soiling the cattle, he thinks they will become fat in August. He cannot help thinking, that where the land, on an average of years, produces seven, or seven and a half bolls *per Scotch acre*, that it may, with attention to soiling, be manured once in every four years, by the manure arising from its own produce; at least that may be done, where there is a due proportion of turnip land; and where that is not the case, perhaps the soiling in summer with green food will do as well.

Mr Hunter adds, that by the practice of soiling, he has now a sufficient command of manure on his farm. In the year 1810, not being so well provided with straw, he had only eight score of sheep in the fold, and in place of giving 320 yards to the score, allowed only 160; whether from want of room to move about, or some other cause which escaped his notice, many of them turned lame before the end of the season; they fattened, however, very well. Last year, he had ten score in the fold, giving 340

yards to the score; the whole surface was covered very thick with straw, not less than ten or twelve pound to the yard; the sheep were turned in, and treated as formerly; none proved lame, and they fattened as usual. The average quantity of straw the same as before; on the whole, from six to ten stone *per score*, according as the weather happened to be moist or dry. Taking every thing into consideration, from seven to eight stone *per day* for each score may be nearly an average. If the spring months are very dry, a little watering, added to the droppings of the sheep, may be required, or less straw may be thrown in. The two last seasons, when the manure of the fold was carted to the dung-heap, which was never done till the sheep were sent to the butcher, he had three or four inches of the surface of the earth of the fold shovelled up and mixed with the dung, as the soil is always fully impregnated with the moisture oozing through the straw to that extent, and it readily fermented with the rest, if not rather assisting it, and increasing the quantity of manure in proportion. He has not weighed the manure for these two last years, and cannot therefore state the quantity exactly, but he thinks it not far from six large cart-loads, for every acre of straw expended.

The degree of fermentation he allows to take place in the dunghill, when all is thrown up and mixed, is just what he finds sufficient to destroy the vegetative powers of grain left on the straw, or any seeds of annuals that may lie in the mass. He would here observe, that any greater degree of fermentation than the above, in his opinion, takes away not only a proportion of the quantity, but also from the quality of the heap.

No. XIII.

**ACCOUNT OF MR HUNTER OF TYNEFIELD'S SYSTEM OF FARMING,
ON THE PRINCIPLE, OF CONVERTING ALL THE STRAW OF A
FARM INTO DUNG.**

MR Hunter of Tynefield has favoured me with the following account of his farm, explanatory of the system he has adopted, that of converting all the straw of a farm into dung, which seems to me peculiarly advantageous in the management of a turnip-land farm.

Mr Hunter's farm consists of 350 Scotch, or 437 English acres. The stock of horses for labour are sixteen. The other stock cannot be stated, varying according to the quantity of green food that is there produced. It is only necessary to observe, that about ten sheep, weighing from twelve to fourteen pound per quarter, require from thirty to thirty-two tons of turnips, (the average produce of an English acre), to fatten them for market. Mr Hunter also keeps some cattle for winter *soiling* *, (if that expression can be made use of), which are bought in October and November, and sold in March. The sheep are fattened sometimes sooner, but the above weight of turnip will keep them till that time. The cattle are sold as soon as fattened, if the market offers, and are sooner or later ready, in proportion to the condition they might be in when put up to feed †.

* Soiling is commonly understood to mean giving *succulent herbage* to live stock; but if it properly means *making dung*, it may also be applied to the giving of *roots* for the purpose of feeding animals, and *making dung*.

† It is calculated, that an acre of good turnip would feed two and a half

Mr Hunter raises four or five acres of turnips for one of ruta baga ; but ruta baga requires one-third more manure to produce a full crop.

The crops Mr Hunter raises of turnips and of ruta baga are as follow :

1. Turnips.

	Per Scotch Acre.	Per English Acre.
Greatest crops, the turnips	38 tons,	
the tops	6 tons,	44
Smallest crops,	- - -	32

35
 $25\frac{5}{8}$

2. Ruta baga.

Greatest crops,	- - -	92	$25\frac{5}{8}$
Smallest crops,	- - -	23	$14\frac{3}{8}$

Mr Hunter was accustomed to make the intervals of the rows from twenty-seven to thirty inches. He found, at that time, the crops to average about three or four ton less *per acre* than he now does, when he makes the intervals twenty-four to twenty-six inches *.

Mr Hunter begins to sow winter wheat after turnips, whenever the weather will permit, in January, and continues sowing when the weather is dry till about the 12th of March. He afterwards sows the whole of his turnip break or shift, with summer wheat, of that sort recommended by Sir Joseph Banks. He had it from Lincolnshire seven years ago, and has sown it at all

cattle of 30 stones Amsterdam each, $17\frac{1}{2}$ oz. to the pound, and 16 lbs. to the stone ; but say that only two cattle are fed per acre, in that case, it is contended, that 440 lbs. Amsterdam more beef than mutton, would be produced from equal weights of turnips, provided that the turnips be consumed, *at the stall, by the cattle.*

* This can only be the case, however, where the land is in very good condition. Intervals of from twenty-eight to thirty inches are to be preferred, with land not in good condition, or where abundance of manure cannot be given.

times, during the spring months; but he has now ascertained, that the proper time of sowing it, in the climate of his neighbourhood, is the two last weeks of April.

The weight of hay, from clover and rye-grass, may average 150 stones of twenty-two pound each, *per English acre*.

Mr Hunter sows wheat after clover, about the middle of January, if the season will allow; if not, as soon after as possible. He ploughs his clover stubble early in December, so that the snails bred among the clover may be turned up and destroyed. Formerly, he used to plough and sow in November; but these vermin, not being then effectually destroyed, crept into the ground again, and coming out in spring, thinned the wheat materially. Ploughing in December, and sowing in January, or February, has answered his purpose of destroying these vermin effectually.

The produce of wheat after clover is eight bolls *per Scotch*, or twenty-seven bushels *per English acre*; that of oats, is ten and a half bolls *per Scotch*, or fifty-two bushels *per English acre*.

Mr Hunter pastures very little with cattle or horses; indeed he proposes giving it up altogether, unless in barren soils where the plough cannot be introduced; and means to convert any clover that may be left from soiling into hay, for his horses in winter and spring; and by giving fourteen pound of oats *per day* to a horse, with ruta baga, he has been able to save a third part of the allowance of oats given to his horses, when no hay or ruta baga were used. On the above allowance, Mr Hunter's horses are worked nine hours every day, when the weather will permit.

The manure hitherto given to turnips by Mr Hunter, has not been so great as he wished; but as the quantity on the farm increases, a greater quantity has been applied. Mr Hunter is quite clear, that the land can never be over-manured for turnips.

The depth of the first furrow for the turnip fallow is from nine to twelve inches, where there is a depth of soil; the after ploughing about six or eight; after the turnips have been eat off, the ploughing ought only to be about three inches for wheat, to

prevent the seeds of annual weeds being brought up; after the clover, four or five inches is a proper depth for oats or wheat.

The stock kept upon turnips or clover, have the refusal of water at all times when soiling; *cattle in summer must have it.*

When turnips are taken up to the extent of a half, four rows are left, and four taken up alternately; if a third part is to be taken, six are left, and three taken alternately. As soon as the turnips, or ruta baga, begin to run or shoot in spring, they are taken off the field, when the tops and roots are cut off; they are then piled up in some place sheltered from the sun or too much air; and being covered with a little straw, and kept moist, they may be preserved as long as they can be wanted; the ruta baga will be perfectly good to the first of June.

Mr Hunter sows no more barley than is required for paying his farm-servants their wages in kind, which are partly paid in barley; having from experience found, that wheat after clover, sown with barley, often fails. When he began farming, he suffered severely by not attending to this important rule in agriculture *.

When circumstances permit, Mr Hunter limes once in fourteen years, at the rate of 60 barley bolls per English acre. Lime ought to be applied to all lands under a rotation of four, where white and green crops are sown alternately.

The weight of potatoes per English acre, under good culture and a proper soil, is from eight to ten ton. Mr Hunter was in use, before he found that horses thrrove on ruta baga, to give them potatoes occasionally, though they did not thrive so well on them, even when steamed, as he could have wished. He has now laid potatoes entirely aside, unless those raised for swine, finding ruta baga far superior for horses.

It is proper to explain the system adopted by Mr Hunter for cultivating light land. The basis of that system is, 1. Alternate

* It is an old Scotch maxima, “ He that sows wheat after bear, had need of meikle gear;” or, He should be a rich man, who sows wheat after barley.

white and green crops; 2. Converting nearly the whole of the straw produced on his farm into dung; 3. Ploughing deep at particular periods; and 4. Soiling both summer and winter.

1. The rotation he follows is, 1. Turnips; 2. Wheat; 3. Clover; 4. Wheat or oats; half of the clover being pastured with sheep, whilst the other half is used in soiling work-horses. The clover stubble is broken up for wheat or oats, generally in the proportion of two-thirds for wheat. Under the above rotation, the crops, on an average, have considerably increased in produce.

2. Mr Hunter's object is, invariably to convert almost the whole of the straw into manure; for by giving plenty of green food, very little of the straw is eaten by the cattle or sheep, either in summer or winter. The horses alone require some straw, along with the ruta baga at all times; but during the first months of winter, November more especially, when ruta baga has not reached its growth, a few of these roots are given, and a greater proportion of straw or hay is wanted. If any considerable quantity of clover can be converted into hay, the straw will be perfectly unnecessary, unless for litter.

3. Soon after Mr Hunter began this system, he thought that the turnip, and other crops, were rather failing off; but fortunately he discovered a remedy, which was to plough very deep the first furrow given to the turnip fallow. This he did, whatever was the depth of the soil, sometimes using three or four horses in the plough. Since he adopted that practice, all the crops are more certain, seldom if ever failing, and never from being often repeated, unless owing to the inclemency of the season.

4. Mr Hunter makes it a rule to soil both summer and winter, preserving as much straw from the winter soiling-fold, as will be sufficient for littering horses, young cattle, and swine, during the summer, giving always plenty of green food, chiefly clover. Soiling in an open fold, with cut clover in summer, does not require so much straw, as winter soiling with turnip. He has not ascertained the proportions exactly, but thinks that one-half will suffice in summer that is required in winter.

The stock are fed in the following manner: They have always

abundance of green food or roots. One-half, or sometimes one-third of all the turnips produced upon the farm, are carted to the fold or straw yard, to sheep, young cattle, and swine. The swine have at all times clover in summer, and turnip or ruta baga in winter, together with potatoes for those meant to be fattened. The working horses have also half a bushel each of ruta baga during winter and spring; so that all the stock are soiled, the milch cows excepted, who get the whole chaff, and other refuse from the threshing mill, and the sheep, when pastured on clover, to consolidate the ground.

Mr Hunter is decidedly of opinion, that any soil adapted for turnips, and that will produce seven bolls of wheat *per Scotch acre* (or 24 bushels *per English acre*), or 9 bolls of oats *per Scotch* (or 44 bushels *per English acre*), cannot be put under a more profitable system, or rendered more productive, than in the way he has suggested. By the frequent ploughings given to the turnip break or shift, the land is made perfectly clean. Turnip is the only crop, for which, according to Mr Hunter's experience, land cannot be over-ploughed. So much ploughing for turnip, would, in his opinion, be hurtful to the after-crops, were it not that one half or more of his turnips are eaten on the ground with sheep, which brings it to a proper consistence for the succeeding crops of wheat, &c. Where land has been over-cropped, or it may rather be said *over-ploughed*, farmers will find two or three years pasture necessary to allow the soil to consolidate; but he is so partial to soiling, that he thinks two years soiling preferable to two years pasturing, even though the second year's crop should be greatly deficient; as he is certain, during his whole practice, of constantly having oats after cut clover, as well as the other crops, fully equal to those after pasture, and that the like will take place during the whole after-crops in the rotation.

This idea of soiling two years in succession, instead of pasturing the second year, is justified by the opinion, that one acre soiled is equal to two pastured.

No. XIV.

ON GRUBS AND CATERPILLARS, AND THE ADVANTAGE OF CROWS FOR THE DESTRUCTION OF SUCH VERMIN.

MR JOHN SHIRREFF doubts much if either frost or lime will destroy the grub. It can easily avoid frost, by going deeper into the earth. The coats of insects, that destroy young grain, whea in the grub state, are hard, *dry*, and as tough as leather, so that they would most probably resist the effects of any small quantity of quicklime that might happen to come in contact with them; and calcareous matter is destructive to insects in a caustic or hot state only. How soon exposure to the atmosphere deprives lime of this quality is well known. As to killing grubs by rolling, unless accidentally squeezed between two stones, he should doubt the fact. It is difficult to break or cut their skin with the thumb-nail pressing them against the forefinger; their bodies are so elastic, that they defy a very strong obtuse pressure, such as that of a roller.

Slugs may certainly be killed by quicklime and by rolling, if they be attacked *when on the surface of the ground*, where they are every soft morning in search of food, which consists of the most delicate and tender parts of young vegetables.

Mr Shirreff informs me, that Mr Alexander Tait, a most intelligent and respectable man, who rented the old orchard and garden of The Byres, the ancient seat of the Lindsays, now the Earl of Hopetoun's property, in the vicinity of Haddington, was so much tormented with slugs eating his young pease in spring, that he tried various plans to destroy them. He even gathered them in such numbers as to fill earthern jugs with them, in a

single morning, turning out his whole family to pick them up. Still, however, they ruined valuable crops. He, at last, brought some lime from the kiln, and, getting up before day-break, had a quantity immediately slackened, and carried in a wheel-barrow to the place where he had sown his early pease. As soon as day dawned, to allow him to see the state of things, he put some of the hot lime into a sieve, and, going to the windward side of the pease, he gently shook the sieve. The hot caustic powder instantly pervaded the surface of the ground to leeward. In this manner he went along the whole windward side of the plot. He observed that a particle of lime did not kill a slug, for the insect had the faculty of throwing off a slimy slough, and disengaging itself from the particle; but if, in the progress of its hole, which it immediately made for, it came in contact with a second atom, however small, which it was almost certain to do, it had not the power of extricating itself as in the former instance; but, writhing about in a thousand contortions, it soon expired.

By persevering in this way of killing slugs, Mr Tait prevents them from ever doing him material injury.

The most effectual mode of killing grubs, Mr Shirreff conceives, is, by perfect aration of the soil, in the convertible system of husbandry. By this means, the insects and their nidi are frequently exposed to the attacks of small birds, and rooks, which are very fond of them. Moles are great enemies to them also; but the cure is as bad as the disease.

Mr Rennie of Phantassie has made a most useful discovery, regarding the best means of destroying the caterpillar, so destructive to gooseberry plants, which Mr Curwen has very properly inserted in his Report to the Workington Agricultural Society for the year 1810. Mr Rennie has ascertained, that the caterpillar deposits her eggs in the earth, below the gooseberry tree. These are ready to hatch just at the time the young leaves are budding, so that they immediately afford food for these destructive reptiles. The method he has adopted for destroying them is, previous to the gooseberry bushes coming into leaf, to have a portion of the upper mould raked off, and mixed with hot lime, which destroys the eggs. Mr Rennie made an experiment.

that has put the matter beyond doubt. He kept a part of the soil exposed to the air, and brought leaves and placed upon the earth. The caterpillar hatched, and immediately attacked the leaves. This remedy against an enemy that frequently destroys this most valuable and profitable crop is so easy, that those who suffer can have no right or pretence to complain.

In a recent communication, Mr Niel Ballingal, an intelligent farmer in Fife, gives the following account of the means by which a valuable field was preserved from the vermin that attacked it. He begins with remarking, that during the spring of 1813, the grub-worm was most destructive; in particular, that he had a field of 20 acres of oats, (on old grass ploughed up), where slugs innumerable, and the grub-worm together, threatened absolute destruction to the whole field crop. He ordered half the field to be limed with hot lime at 4 o'clock in the morning, and then immediately rolled it with a heavy roller, (cast metal); the roller destroyed the slugs even where the lime was not applied, and still more completely where it was. But neither the lime nor the roller had any effect on the grub, and destruction went on. The field otherwise promised a most productive crop, being in high order.

Mr Ballingal next prohibited shooting crows on any part of the farm, or at all disturbing them. The consequence was, that every morning this field was covered by them, (a rookery being at two miles distance). Not a clod but they had turned over, and devoured such numbers of grub-worms, that very soon the ravages on the crop ended, and he has now the prospect of a full crop, of at least 150 bolls, on a field, where, but for the crows, he would not have had either straw or corn. He is persuaded, therefore, from his own experience, that farmers would have cause to regret the extirpation, or even too much diminishing, the number of crows. He is convinced that Providence intended them to be useful. The grub this season, (1813), had it not been for the crow and the magpie, (equally an enemy to the grub), would have destroyed more grain in this county, (Fife), than all the crows in it it would have done in seven years.

Rooks.—Mr Church of Hitchill, complains that the corn crops in his neighbourhood suffered much last spring (an. 1813) by the grub, insomuch that he was often obliged to re-sow. He is of opinion, that the county where he resides, (Dumfries-shire), would not suffer so much by grubs and wire-worms, were there more rooks in it.

No. XV.

ON THE ADVANTAGES THAT WOULD ARISE FROM THE DISCOVERY OF A REAPING-MACHINE.

The following estimate has been drawn up by Mr Donald Cumming, to prove the advantages that might be derived from the discovery of a reaping machine, which, he flatters himself, he has invented.

The general price of reaping, with the sickle or hook, is about 12*s.* *per* English acre. The expence of reaping, by a well-constructed machine, cannot exceed 4*s.*; so that there would be a saving of 8*s.* *per* acre in the expence of labour alone; to which may be added 8*s.* more on an average, as saved by the expeditious mode in which the work would be performed, by means of which, the crop would be speedily and effectually secured against the effects of shaking winds and rotting rains. The total benefit, therefore, would be no less than 16*s.* *per* acre,—a saving so great, as even to equal the whole rent of much arable land in the kingdom. Besides, by the machine cutting so low, much additional straw would be obtained, a point of considerable moment. Two reaping machines would be able to reap 40 acres *per* day, or 240 in six days. The expence of each machine, it is supposed, will be from £.18 to £.20, and the only additional expence would be, the mere repairs of the knives, which are the only part exposed to wear. It is supposed that a machine would last for twenty years,

if carefully laid by when the reaping is over. One machine may serve several small farmers, if made at their joint expence.

The discovery of such a machine, therefore, might be considered as an object of the greatest national importance. It may be proper, however, to observe, that in the opinion of a most respectable correspondent, of all the improvements hitherto attempted, that of the reaping-machine seems to him the most hopeless. The varieties of soils, surface, and situation of the crops it has to contend with, appear to him almost insurmountable bars to any machine of the kind ever proving usesul. It is well known to every agriculturist, that the difficulties attending the reaping of laid and twisted crops, requires not only eyes, hands, fingers, and feet, but also a moderate share of judgment. Now, even suppose a machine to possess all these qualifications, and shut its eyes, what could it do? If the eyes of a humen being were to be shut, he could not reap one handful of a crop twisted together. As all these qualifications, therefore, are required, he despairs of any ever being invented that can be generally useful. These very difficulties render such a discovery, if it can be accomplished, the more important.

The attempt, however, ought not to be given up because it will not answer all surfaces and seasons, and every different state of the crops. If one half of the crops in the country could be thus reaped, the advantages would be incalculable. Besides, if the saving were considerable, it would then be for the interest of farmers, to bring their land into a suitable state, by cleaning it of stones, levelling, and rolling it. There would still be sickles enough for reaping laid and twisted crops.

No. XVI.

ON DEPOPULATION BY INCREASING THE SIZE OF FARMS.

It is certainly an irksome situation for any proprietor to be placed in, to be under the necessity of making material alterations in the arrangement and management of his property, by which some individuals may either be put to inconvenience, or perhaps for some time considerably distressed. Nothing, however, can be more absurd, than for the possessor of a valuable estate, who has it in his power to render himself and his family comfortable ;—to bear, without difficulty, the severe pressure of taxation ;—to increase, not only his own income, but the revenue of the public ;—and, by introducing new systems of husbandry, to render his country independent of foreign nations, either for the subsistence of the people, or for articles essential to a maritime and manufacturing empire, than to throw away all their advantages, out of delicacy to persons, whose prejudices stand in the way of all their improvements. The proprietor of an estate, is in fact a trustee for the public, and should manage his property in the manner the most likely to be beneficial to the public at large. For the general interest, our seamen are pressed into the naval service, and our labourers into the militia. Why then should not our husbandmen, for the attainment of the same object, be compelled to make greater exertions, and to abandon ancient absurdities, for the benefit of their country ?

No. XVII.

ON THE FATAL EFFECTS RESULTING FROM THE WANT OF CAPITAL, IN CARRYING ON AGRICULTURAL OPERATIONS. EXTRACTED FROM DR ANDERSON'S WORKS ON AGRICULTURE, VOL. III. P. 97.

EVERY person knows, that if a man shall attempt to grasp at an extent of trade or manufacture, beyond the reach of the capital he can command, he must do it with such an enormous disadvantage, as to be involved in a short time in certain ruin.

The reason of this is, that he has to cope every where with rivals, whose extent of capital gives them such a decided superiority in regard to purchases and sales, as to knock down all competition.

Were all these great capitals withdrawn from those branches of business, this competition would indeed be removed, and the poor trader or manufacturer would then be suffered to exist; but his efforts would be feeble, and their effects inconsiderable, in proportion to the weakness of his means; for innumerable obstructions, that must at once give way to the energetic power of the one, will oppose themselves as irresistible barriers to the feeble exertions of the other.

The case is exactly the same in regard to agriculture. Let two farmers, equally alert, skilful, and industrious, the one of whom has a commanding power of capital, while the other is stinted in his circumstances, be set down upon two contiguous farms of equal quality in all respects, and observe the result. While the first, in consequence of being able to avail himself of every favourable circumstance that occurs, can obtain every article he wants at the cheapest rate; can purchase such manures

as may be wanted to enable him to carry on such operations as he sees necessary for meliorating the soil, exactly in the most favourable season for it, at the beginning of his lease, and can procure servants and labourers in such abundance, as to conduct all his operations without waste of any sort, and at the cheapest rate;—the other must have the mortification to see the most favourable opportunities pass by, without being able to avail himself of them; must only purchase manures when he can, not when he would; must let slip the most favourable opportunities for obtaining a great profit; must postpone the necessary improvement, because of inability to perform them. Thus the mind, struggling against misfortunes, loses its energy, and it possesses neither the means, nor even the wish, to attain the knowledge which the successful improver enjoys, whose mind, alert in the vigour of successful exertions, springs forward with alacrity, to catch every hint which promises to add to that capital, which he has the satisfaction to find is every day increasing.

No. XVIII.

ON ENCOURAGING TENANTS TO PLANT TREES.

The following Clause, in the Earl of Chesterfield's Leases, regards the Tenants planting.

“ AND also shall and will, yearly, during the first five years of the said term hereby demised, at his, or their own proper costs and charges, in such places as shall be pointed out by the steward of the said earl, his heirs or assigns; and if not so pointed out, then upon the banks and hedgerows of the said demised premises () sets of good young oak, beech, ash, elm, or sweet chestnut, whichever is most suitable to the soil thereof, and shall and

will, not only protect the same when planted, but constantly plant fresh sets, as often as any shall die or be destroyed. To the end that there may be raised upon the said demised premises during the said term number of trees."

Proportion of Trees to be planted.

The limited number is in general five trees annually, to every ten pounds of yearly rent. For example, in a lease reserving a rent of L.125 a-year, 25 trees are to be annually planted, the five first years; making in all, on such a farm, 125 trees to be preserved or replaced, so as to leave at the end of such a lease 125 growing trees.

Observation.

Many of the tenants were at first rather slack in performing this covenant, pleading ignorance; but upon the circulation of Mr Blaikie's Treatise on Forest Planting, their ignorance appears completely removed, and it is now universally adopted, with pleasure and eagerness.

W. STRONG,
for SELF, STILL, and A. STRONG,
Stewards.

January 30th, 1811.

Memorandum.

It might be an improvement in this excellent system, if the tenants were to have a certain sum, say sixpence *per tree*, for *every thriving tree they had planted*, when it had reached twenty years of age. This would give them an interest in the prosperity and preservation of the plantation.

The following Observations, on the system of encouraging Tenants to carry on Plantations, adopted in Ireland, is extracted from the Monmouthshire Report, lately published.

Landlords in England, who grant leases, frequently insert a clause to oblige the tenant to plant a certain number of forest trees yearly. This compulsive clause is seldom well performed, nor is it in the nature of things that a man will do that willingly, by which he is put to some trouble and expence, without a chance of reaping any benefit from it. Some stimulus is necessary to engage the tenant's attention to the propagation of timber; and this is well provided for in Ireland, by a method, that the legislature might establish on this side of the water, with equal hopes of success.

A law exists in Ireland, by which any tenant, holding by lease for any term, may take a beneficial interest in planting timber trees upon the land he occupies, in the following manner:

There is an office in Dublin, at which the number and quality of the trees are registered by the planter, with the name of the land and of the land-owner. At the expiration of the lease, the trees are to be valued by two persons, to be chosen by landlord and tenant, and the landlord has his option, either to pay his tenant such value as these valuers set upon the trees; or, in case of his refusal, the tenant may sell and carry away the trees.

By this method of securing the tenant a return of his capital, with the profits of it, many valuable groves of timber are produced, which otherwise never would have existed. The landlord has the advantage of obtaining a stock of timber at a fair value, which he would not have had but by means of such a reasonable provision on behalf of the tenants.

No. XIX.

ON THE SYSTEM OF PUTTING IN SPRING CROPS WITHOUT SPRING PLOUGHING, AND THE ADVANTAGE OF THAT PRACTICE.

BY ARTHUR YOUNG, ESQ.

IN the Suffolk Report there are many details of an improvement in tillage, considered in that county as of the greatest importance, and which has been extensively practised for above 20 years. The soil of the district where this practice prevails, is a wet loam, on a clay marl bottom, too heavy for turnips, however well drained. The old system of the country was, (a plan common throughout the kingdom), to give one spring ploughing for peas or beans, and two or three for barley or oats. The uncertainty of the weather in spring rendered this system of tillage the most difficult and perplexing part in the whole business of a wet-land farmer; drying north-east winds left a surface of hard clods, and rain turned it to mud; much expence, late sowing, and bad crops, were often the consequence; but the new system introduced, has remedied every evil, and placed the farmers in a state of great security.

The management they have adopted is this; while the land is yet dry in autumn, the fields are carefully ploughed into ridges, exactly of the breadth which suits the various implements to be employed in the spring, such as harrows, scufflers, scarifiers, and drill-machines, all adapted to one given breadth, so that no horse, when drawing any of them, may ever set a foot on the ridge, but more solely in the furrow *. The governing principle is this; the

* It is proper to state the distinction between scufflers and scarifiers. The scuffer is an instrument with flat triangular cutters, merely to cut the weeds,

winter-frosts leave the surface in the finest possible order for seeds, loose, friable, dry, and porous. In this state, if rain falls on it, the soil dries again, and recovers its porosity; whereas if rain falls at this season of the fresh-ploughed land, the tendency is to plaster it, and it does not again become porous. If such a friable surface be ploughed down, nothing equal to it, for the seed of a crop, is to be expected one year in twenty; whereas, by retaining the soil, thus meliorated by the frosts, on the surface, the spring crops may be sown sometimes in the beginning of February, and in other seasons about the middle or the end of that month, or perhaps the beginning of March, and in much better order for a crop than, according to the old system, at the end of April, or throughout the month of May, though with an additional expence of perhaps 30s. per acre. If there are weeds in the field, a scuffler is made use of first, followed by harrows, then by the drill-machine, (for in that part of Suffolk the corn is generally drilled); and, lastly, a light harrowing to finish the tillage; but sometimes the drill goes on at once, followed only by a light harrowing. The success which has attended this practice has been so decided, that all the best farmers have for some time past adopted it.

Such was the state of this husbandry, on the strong lands of Suffolk, brought down to the year 1804. The president of the Board of Agriculture, being informed that the practice had rather declined, he requested John Moseley, Esq. of Tofts, near Brandon, to ascertain that point; and in April, 1813, he had the pleasure of receiving a letter from that gentleman, informing him, that having been at Stowmarket, and other places in the Strongland district, and made many enquiries concerning the progress of the system above described, from many intelligent practical farmers, he found, "that the use of the scarifier, instead of the plough, *in the spring*, is more predominating, instead of less so;

and they are afterwards raked up by harrows. The scarifier, on the other hand, has bent coulters, tears up the couch and other root weeds, and brings them to the surface. It has various other names, as tormentor, cultivator, &c.

and from the tilth it gives the land, there is every reason to suppose, that it will exclude the application of the plough to heavy lands in the spring."

This opinion is given from the enquiries made by Mr Moseley among the best practical agriculturists, and from his own observations in that county.

It is remarkable, that an excellent writer on agricultural subjects, (Mr Lisle), who practised husbandry on a large scale at the conclusion of the 17th, and for several years at the beginning of the 18th centuries, recites two accidental experiments on harrowing in spring corn *on autumnal furrows*, in which the success was very great: and yet he does not seem to have made that use of the idea which so long afterwards forced itself in Suffolk. The management was as much unknown in the common practice of Britain as in that of Kamschatka for more than forty years; and as so many practical men are apt to consider whatever is found in books as mere theory, or undeserving of notice, it may demand an hundred years more to spread this admirable practice through the kingdom.

The principle of saving tillage has been extended in Suffolk, even to the case of turnip land, upon which scarifying has been substituted with success for ploughing: but this practice must necessarily depend on the state and temper of the soil, and cannot be generally adopted; but its application, however, to the case of wheat, on bean, pea, and tare stubbles, has been largely and very successfully practised, by working the preparation with the scuffer and scarifier only; and as the bottom of the furrow, in this method, is left in a firm state, the wheat crops have succeeded much better than when the pulverization has been carried to a greater depth. All these methods are detailed from the practice of many very able farmers in the Suffolk report.

In regard to Scotland, the practice of spring sowing, without spring ploughing, has been known above 40 years, and is likewise strongly recommended by Lord Kames, in his Gentleman Farmer, originally printed *anno* 1776.

No. XX.

LETTER FROM WM. WARD JACKSON, ESQ. TO SIR JOHN SINCLAIR,
ON THE LEVELLING OF HIGH RIDGES.

Sir,

I RECEIVED, a few days ago, a letter from Mr Barrington of Sedgefield, conveying a request from you, that I would, for the information of the Board of Agriculture, send you an account of the process for levelling high ridges, which I have practised on my farm, and which I believe Mr Barrington has, on my suggestion, adopted to a considerable extent.

The inconveniences, expence, and loss of cultivating high, broad, crooked ridges, are well known, equally so the labour and danger to succeeding crops, when suddenly, or even gradually, levelling them by any common mechanical operation of ploughs, drags, &c. It is therefore with great readiness, that I do myself the honour of addressing you, to describe a process which I have found of perfect efficacy in remedying, with trifling expence, and without risk, the inconveniences complained of. It is likewise no inconsiderable encouragement to me to do so, that the method has received the practical approbation of so spirited and attentive an agriculturist as Mr Barrington. I may here observe, that I am aware that processes of removing the soil in levelling, so as not to injure succeeding crops, have been suggested, particularly by the late Dr Anderson; but as there appeared to me objections in point of effect, labour, and expence, to the practices recommended, (although the object in principle was the same), I will not occupy your time by any comparatory remarks, but proceed simply to explain the mode I use.—The first operation is, to deepen and widen the original furrow, which is done by commencing a few feet from it, and ploughing a bout *towards* the

ridge on each side of it, and by continuing to plough, turning to the left at the ends, the furrow will be thoroughly opened out. As the sort of trench thus formed, is to become the burying place of the inert soil, to be thrown as after described, its capaciousness should be regulated by the probable quantity of the soil it may have to receive. If the ridge does not exceed from six to nine feet, and is not extremely high, the opening process already described will be sufficient. If the ridge much exceeds those dimensions, it would be desirable, that the plough should commence more than three feet from the furrow, and that a plough with a mould-board, a good deal curved, and wide behind, should afterwards commence one bout nearer the furrow than the first plough, and proceed laying up again the already turned soil, thus still more widening and deepening the trench in the centre, which I designate by the name of the furrow-trench. This preparatory operation being completed, the remainder of the ridge is, by deep ploughing, to be cloven down, beginning with the first furrow that had before been turned towards the ridge, and now turning it down upon the next furrow towards the furrow-trench, so as to be ready to assist in covering the soil to be deposited in the furrow-trench. The last bout, in cleaving the ridge, should be attentively ploughed, so that the trench, formed by it on the top of the ridge, may be as wide and deep as may be; and if any *before untouched* soil be brought up by it, *that* may be thrown into the furrow-trench. A plough adapted for the principal operation is now to be introduced, drawn by a strength not inferior to that of three good and steady horses. The plough should be strong, the irons sharp, and set so as to go deep into the ground without difficulty. This plough now passes along, in the centre of the trench formed on the top of the ridge, ploughing up a slice of clay which had heretofore been *below* the reach of a plough. A number of women and boys are stationed along the ridge, who throw into the furrow-trench the last turned slice, while the plough is turning up a similar one on an adjoining ridge, to which they repair when they have finished *that* upon which they began. The plough then returns to the first ridge, proceeding along it in a reverse direction to its former progress, and turns

up in the ridge-trench another slice of clay, which the labourers return to throw away. It will seldom be practicable to plough up any more in this trench, now very considerably deepened; the plough therefore turns back into it the same surface soil, which, in the original cleaving, had been divided, and is now lying on its brink; and then following precisely in its last track, the plough turns up the slices of inert clay, which laid under the last turned in soil. This inert clay is also thrown into the furrow-trench. The plough then turns into the last-made trench the surface soil adjoining to it; then turns up a new slice of clay under it, and goes on repeating this operation till the surface of the field exhibits such an appearance as to authorize the expectation that a cross-ploughing, or brake-harrowing, would make it level, allowing for the settling of the newly-accumulated soil in the furrow-trench. This appearance will, in most situations, be produced by the method described; but in extreme cases of height and breadth, the *ridge* might again be cloven down, precisely as at first, and the rest of the process repeated. An increase of expence would of course accrue, but no injury or risk, however often the ridge were cloven, *for the original surface soil always remains on the top of the land*, though at a lower level; and the soil which had been laid up on each side of the furrow-trench will always so far mix with, and cover the inert clay deposited in it, as to prevent any deterioration of crop whatever. When the land is levelled, I put it into ridges of five feet six inches, the size of Mr Greig's, upon whose plan, as to ridges, most of the arable part of my farm is conducted.

It is scarcely necessary to remark, that the ploughs, if more than one be wanted, should be proportioned to the number of labourers, and, at the same time, so that neither have to wait for each other. There ought also to be one, or (if the ridges are long, and a great number of hands employed), two overlookers. The fields I have levelled, are for the most part of strong soil or clay; which last is, when first turned up, so firm and tenacious, as to be easily taken up and thrown away by women and boys, who can nearly do as much as men at this work. I have seldom had recourse to men, although, were the subsoil of a crumbly nature,

I believe that it would be the most economical way to employ them with spades and shovels, instead of the hands of the weaker class of labourers.

In stating to you the expences of this process, I should wish to avoid being thought too sanguine, and I have not by me any precise calculation; indeed, after the first field I levelled some years ago, and to which I particularly attended, I was so satisfactorily convinced of the saving and utility of the plan, as to exclude all idea of comparison from my mind. So far however I can state generally, in the full conviction that experiment, properly and attentively conducted, will bear me out, viz. that the expence of levelling ridges, where the subsoil is of such a nature that it can be done by women and boys, will not amount to more than the hire, or fair charge, of the ploughs, harrows, &c. which would have been necessary to level the ridges by downright repeated cleavings; and that where it is necessary to employ men with shovels, their expence, over and above the hire of ploughs, as aforesaid, will be more than counterbalanced in the first crop, not to mention, in either case, the saving of wear and tear and cattle, the advantage of giving useful employment to the poor, and the certainty of future even crops. To the last point I can speak decisively from experience. Seven years ago I levelled a field by main force of ploughs, &c. and have never had an even crop since, though I have fallowed, limed, and manured it. The following year I commenced, by ploughing, the gradual levelling of a field of the same quality, which was finally accomplished last year. During that time my crops were always more or less uneven, although not so much so as in the last-mentioned field. Every year I was bringing up a little fresh clay, that was good for nothing at the moment, and this was always happening up to the very last operation of levelling, so that even now I do not expect even crops for a few years to come. (I was also suffering inconvenience in not being able to have the size of my ridges as I wished them.) But upon the fields I have levelled by the process I have had the honour to detail to you, I believe the most accurate observer could scarcely perceive the slightest difference. It appears to me a peculiar advantage also, that the sort of land,

namely, strong clay, which is the most unprofitable in wide ridges, most expensive and laborious to level, and most hazardous and unproductive when levelled in the usual methods, is, by this mode, rendered the most easy and least expensive. There is yet another advantage attendant upon it, which I ought not to omit pointing out to you, namely, the almost immediate means it furnishes of attaining cleanliness. From the flatness of the sides usual in wide ridges, by which surface water is detained, it is very common to find a complete colonization of pernicious weeds, established for perhaps two yards on each side of the furrow, and that the attempts at extirpation, which are made when the fallow years arrives, are ineffectual. If then the ridges were cloven repeatedly towards each other, a still greater, though in space somewhat narrower, accumulation of these established weeds would take place, and would in great measure continue for some time the original foulness. But by the present plan, these weeds are wholly raised to the top, so that the operations of fallowing easily eradicate them; there is likewise a complete bar of soil free from them, so placed as to destroy that union on each side the furrow which had so long defeated the industry of the farmer, and thus additional facility is afforded for complete extirpation.

I fear I may appear to have been too prolix or minute on the subject of this letter; but if I should have been fortunate enough to succeed in making myself clearly understood, I trust I shall meet with your forgiyeness. I beg to offer my thanks for the pamphlets transmitted to me by Mr Barrington, and have the honour to be,

Sir,

Your very obedient servant,

March 13th, 1818,
W. WARD. JACKSON.
Normandy by Stockton on Tees.

No. XXI.

OBSERVATIONS, BY A SCOTCH FARMER, ON THE HUSBANDRY OF NORFOLK, AND THE IMPROVEMENTS OF WHICH IT IS SUSCEPTIBLE.

IT is with great diffidence that I presume to send you any observations on the husbandry of Norfolk, though I am well acquainted with the general soil of, and have for many years paid considerable attention to, the husbandry of that district.

In my humble opinion, the general husbandry of Norfolk, though assuredly well executed, still admits of improvement in various respects. First, I think that barley, hitherto considered as the staple of Norfolk, is cultivated to such an extent, as to be unfavourable to the growth of wheat, having found, from more than thirty years experience, that full crops of wheat are seldom or never obtained after clover sown with barley. Would the Norfolk farmers substitute wheat (the Burwell wheat may be tried) after turnip, instead of barley, and take potatoe oats, sown very early, or wheat, after the clover, I am convinced that the condition of the light-land husbandry of Norfolk would be greatly benefited. I would here observe, that turnip of every variety should be sown in drills, and completely horse-hoed; and that the culture of *ruta baga* should be extended, having found this root of the first importance in feeding horses during winter, and other stock in spring. It also appears to me, that soiling might be extended with much advantage; and that the grass crops would be far more profitably used in the house and fold-yard, than in field pasture. But the great advantage of soiling consists in this, that it is in the power of every farmer who cultivates a well-managed farm, to have a full command of manure, without

being obliged to have recourse to the aid of any other than lime, once in twelve or fourteen years.

In the hands of unskilful ploughmen, the wheel-plough will answer the purpose of regulating the depth of the furrow, better than any other. I would recommend Small's plough to be adapted to the wheels. In the meantime, a few of the best ploughmen should have swing-ploughs; and when they are accustomed to them, their vast superiority, for handiness will soon appear. The depth of ploughing should be regulated according to the crop for which it is intended. The first furrow for turnips should be given early in winter, and ought to be as deep as the horses are capable of giving it. Here I would observe, that the clover sown among the crop after the turnip, will be found to succeed pretty much in proportion to the depth of the ploughing up of that furrow. The other furrows for the turnip-fallow may be from seven to eight inches deep, when no lime has been laid on the winter-furrow; but if lime has been applied, from four to six inches will be found preferable. I am led to think, the reported failures in the clover crops of Norfolk, are owing to the want of deep ploughing to the turnip-fallow, having uniformly found, that the seeds of all green crops delight in fresh mould. As to ploughing for the other crops, in the four-course shift, I consider three or four inches to be a suitable deepness, after the turnip, and five or six after the clover. In short, if a fresh mould is given in the first stage of the preparatory process for turnip, there is no occasion to plough deep for any other crop in that rotation.

There is little risk of injuring any kind of soil by deep ploughing, during the fallow process, provided a dose of lime and dung is given at that period. I have ever found the operation of lime more powerful on the fresh or new-turned-up subsoil. Ten ton of well-prepared dung, *per English acre*, is a very good dressing.

I am of opinion, that 240 bushels of lime shells, *per statute acre*, would be a very proper dressing for the light soils of Norfolk, if that lime have the same powers as ours in Scotland, or that of Sunderland. I am aware, that some of the English lime differs much in quality, therefore speak of the above quantity with diffidence.

There is not, in my opinion, any rotation, for the general soil of Norfolk, better than their four-course shift, provided barley was excluded. If barley must be continued, no wheat ought to be sown, as potatoe oats will do better after the clover, if sown very early, as the oat requires moisture in its young state. On rich and deep soils, the rotation of six, practised here, would do very well, when beans or potatoes can be introduced. On loams, for instance, the rotation might be, 1. turnips ; 2. wheat and barley; 3. clover ; 4. oats; 5. beans or potatoes; and, 6. wheat. On clay soils, 1. plain fallow ; 2. wheat ; 3. clover , 4. oats ; 5 beans ; 6. wheat. As to the most eligible kinds of wheat, I would sow winter wheat any time from the first eating of the turnip till the middle of March, when the weather is dry, and afterwards summer wheat, or barley, if summer wheat is not found to answer.

I have stated above several important advantages from deep ploughing; but it may be added, that it renders the soil a better medium for retaining the just degree of moisture, suited to allow, or to stimulate the manure, to operate to the greatest advantage.

In regard to a preference between wheat and barley, it appears to me, that wheat is a more valuable article than barley, and, as such, is entitled to the preference, from its being a necessary of life; in fact, as the most essential article of food for the people, I hold, upon public grounds, that its culture deserves the first attention, and that the culture of barley ought, in a political point of view, to be confined to inferior districts, where soil and climate may be inferior to the growth of wheat. The great markets for barley are the distilleries and breweries. The first may be dispensed with; for, were ardent spirits even a necessary of life, in our northern climate, they can be obtained from our colonies, full as well as from the produce of our home field; and as for ale and porter, the great extent of soil and climate in this island, unfavourable to wheat, but suited to barley, will ever be sufficient to produce abundance of grain to supply the brewers with malt.

Additional Observations.

The intelligent farmers of Norfolk, will, I am persuaded, excuse a Scotch farmer, for presuming to make the preceding remarks on the system they have adopted ; and to which I shall venture to add the following observations :

I. Shallow ploughing, and retaining a *pan*, to prevent the rain from sinking into the earth, seems to be highly exceptionable on the following grounds : When moisture is retained in a soil of three or four inches, it must be soon evaporated; and, until rain falls again, the plants have nothing but dew to depend on. Whereas, when the soil is ploughed eight or ten, or even twelve inches deep, there is a *reservoir of moisture*, which is constantly and regularly brought up to the roots of the plants, by the process of evaporation ; and such a reservoir must be peculiarly advantageous, in a dry soil and climate, like that of Norfolk. Shallow ploughing exposes vegetation to be drowned in wet weather, and to be scorched and withered in dry.

It is quite a mistake to suppose, that this *pan* consists of a description of earth incapable of improvement. When ploughed up, exposed to frost, and manured with dung and lime, it becomes an excellent soil, and is peculiarly calculated to encourage the production of turnips, clover, beans, and potatoes ; for these crops, without the advantage of new mould, diminish in quantity, quality, and value.

Another disadvantage attending shallow ploughing is, the waste of manure. In a thin dry soil, the manure which it contains is soon dried up and volatilized, and rendered inefficient by the action of the air and the sun. Dung *must be well covered*, and *kept in a moist state*, in order that the plants, for whose use it is intended, may have the means of deriving full benefit from the gasses it produces.

The following sketches will explain, at one glance, the difference between shallow and deep ploughing, and the advantages of the latter.

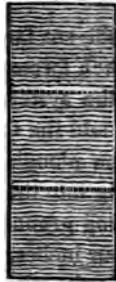
SHALLOW PLOUGHING.

Four Inches.



DEEP PLOUGHING.

Twelve Inches.



In the latter case, there are from four to eight inches of soil, which may be called *the reservoir, or treasury of vegetation*, where moisture is retained till wanted, where manure is protected in a moist state from the destructive influence of the sun and air, and where new soil may be found, which may be turned up when the fertility of the old is exhausted.

There can hardly be a doubt, that land ploughed 12 inches deep, must be worth at least double, land of the same quality, ploughed so shallow as only three or four inches, more pasture being afforded to the roots of the plants, and less injury being sustained, either in very dry or very wet seasons.

It is owing to shallow ploughing, that the crops of turnips and clover in Norfolk are not so productive as they ought to be; that, in many parts of that county, neither beans, nor oats, nor potatoes can be cultivated to advantage *; that barley is often sold cheap, to purchase dear oats for their horses; and that wheat is not cultivated to the extent it ought. Lime from Sunderland, so frequently brought to the northern extremity of Scotland, ought certainly to be tried in Norfolk; and sowing the brown, or the

* The oats should be sown as early as the season will admit of it, so as to give abundance of moisture in their young state.

Burwell wheat in spring, after turnips, instead of barley, till the beginning or middle of March, and afterwards summer wheats, would be found a profitable system. It might be worth while indeed to try an entire new system, on the dry soils, namely, 1. To sow the turnips early in May, when no fly would attack them; 2. To cart off the turnips in October and November; to stack them, and to feed sheep and cattle with them in folds; sowing the land with wheat, which would not be injured by the wire-worm; 3. The third year to have clover for soiling; and the fourth barley or oats.

When one sees the correctness with which all the operations of husbandry are executed in Norfolk; the cleanliness of the land, where the drill system is established; the great exertions made to procure a sufficient quantity of putrescent manure; and the excellent manner in which the farmers of that county in general manage their stock;—it is impossible not to wish, that the system of so valuable a district should be brought to all the perfection of which it is capable; to promote which, these hints are, with great deference, submitted.

No. XXII.

OBSERVATIONS ON THE USE OF OXEN.

BY A CORRESPONDENT.

If an accurate calculation were made, it would be found more profitable to feed cattle well from their birth, like Leicester sheep, and to bring them to early maturity, than to keep them till they are seven years of age, for the sake of three years *occasional* labour. Their warmest advocates have never proved their fitness for all sorts of farm-labour, by discharging the use of horses al-

together; and even Messrs Walker in Roxburghshire, who are the only farmers in the southern counties of Scotland who work oxen, contend for no more than their partial employment. It is admitted, that they do not answer for harrows, for harvest-work, for long carriages, nor turnpike roads; nor, it may be added, will they, in the hurry of turnip-work, drill three acres a-day, which is often done by horses, not for a single day, but several weeks. In fact, though oxen may plough well enough for a few weeks, when changed, as Mr Walker does, and allowed to take their own time, whenever an exertion must be made, as in seed-time, in harvest, in the turnip season, in seeding summer-fallows, &c. the chief dependence must always be on horses, who thus are so much the harder worked, on account of the employment of oxen at other times. Now, let it be considered that *ploughing* is probably little more than a third part of the labour of many farms; if horses only are kept, each pair has an equal share of the labour throughout the whole year; but if one-third of the *ploughing* is performed by oxen, and two-thirds by horses, either the diminished number of horses must be greatly overworked at other times, or there must be several supernumeraries kept to assist them.

Call the total labour of a farm of six ploughs	-	45
Ploughing one-third, or	- - -	15
Two-thirds for four horse-ploughs	10	—
One-third for two oxen ditto	-	5
	—	15
Extra labour two-thirds done by horses	-	30
Done by oxen-ploughs	- - - -	5

or one-ninth of the whole labour of the farm is performed by six oxen, and the other eight-ninths by eight horses; and therefore one horse is equal to six oxen.

Again, if the ploughing is supposed to be equal to half the labour of a farm instead of one-third only,

Call the total labour	-	-	-	30
Ploughing one-half, or	-	-	15	
Horses	-	-	10	—
Oven	-	-	5	
		—	15	
Extra labour one-half, or	-	-	15	30
		—	—	—

Thus there are 25 parts, or 5-6ths for eight horses, and one-sixth for six oxen; or eight horses are equal to twenty-five oxen, or 2 horses = $6\frac{1}{2}$ oxen.

As this mode of calculation does not make any allowance for a threshing-mill worked by oxen, when that power is employed, the result will be more favourable to them; but where water, wind, or steam is employed, or wherever animal power is not used for threshing, one or other of the above calculations are not far from the truth, according to the circumstances of a farm,—being, for instance, near or distant from manure, fuel, and markets, or of a soil suited to turnips, or requiring bare fallows.

It is not to be denied that oxen *may* do other work on a farm than ploughing, though it is seldom they do. Against any trifling advantage of this kind, I would set off the high allowance made under the head of ploughing. Three oxen will never do the work of a good horse-plough, which these calculations take for granted.

The only profitable labour of oxen then is in the threshing-mill. Where old tough sward is to be broken up, they are also a more steady draught than horses, and one or two oxen-ploughs may be then advantageously employed, though not with a view to save the expence of labour but of accidents.

One circumstance more deserves attention. Oxen are seldom bred or reared upon arable farms unless there is a proportion of coarse pasture attached to them. In this case, the farmers of the Lothians and Berwickshire must go to market for strong three-year old oxen, train them for two or three years work only, at considerable expence, employ more land for producing food for them, and after all, keep on a farm of 6 horse-ploughs, 10 horses at

least and 6 oxen, for doing the work of 12 horses; that is, 7 ploughs instead of 6, for which an additional ploughman at £.35 a-year must be employed. For it has been shewn in the Northumberland Report, and the result here agrees with it, that 2 horses are at least equal for farm-labour to 6 oxen, and not to 3. It would be very strange indeed if the late Mr Culley, one of the most eminent and experienced farmers, who at one time worked more oxen than any man in the island, should not be a competent judge in this much agitated question, which the result of his experience might have set at rest.

Perhaps oxen may hereafter be trained to run in coaches as in India, or be employed in the chace, as among the Hottentots; but farmers must wait till these speculations are realized.

It might be farther noticed, that upon every well-regulated farm, every man has his own labour, and every ploughman his own labouring cattle. There is therefore no room for working stock, only *partially* or *occasionally* employed. When horses are always well fed, and a sufficient number kept for the whole work of the year, they will stand an unusual exertion at any particular season, without much injury; or, if assistance is indispensable, one or two pairs of young horses, purchased or reared for supplying the aged annually disposed of, will give it more effectually than oxen.

It appears to me, that this question should be carefully examined, and set at rest, for the legislature have already imposed a tax upon farm-horses, with a view to encourage the use of oxen; and some have recommended an addition to that tax, who have not perhaps studied the subject as they ought to have done, before they pronounced so decided an opinion in favour of oxen.

No. XXIII.

ON MORE ECONOMICAL MODES OF FEEDING HORSES.

BY SIR JOHN SINCLAIR.

THIS is a subject which loudly calls for immediate attention. The heavy expence attending the maintenance of horses, is more injurious to the public interest than is commonly imagined: It augments the charges attending all agricultural operations; and, consequently, increases the price of provisions: It adds to the expence of every description of conveyance, which, either directly or indirectly, must be felt by every individual in the community; and it wastes a species of food, which in many parts of the united kingdom is very generally consumed by mankind, and found to be wholesome and nutritious. On all these accounts it is of essential importance, that the following points should be fully considered.

1. What nourishment is really necessary for horses, whether kept for pleasure or hard worked. 2. What articles can be given them, not usually consumed by man. 3. What articles can best be spared from human consumption. And, 4. Whether any new modes cannot be devised, by which the usual food of horses will go farther, than according to the common system.

1. There are numbers of horses, kept solely for pleasure, also cavalry horses, not on service, to whom a restriction of nourishment would be advantageous, instead of being hurtful; for the extra nourishment, instead of doing them good, is the source of disease; and by some recent experiments, *on a great scale*, it has been ascertained, that even where horses are subjected to severe labour, the expence of feeding them may be greatly reduced.

These experiments I shall endeavour, as briefly as possible, to detail.

Mr Willan, who is interested in so many stage-coaches to and from London, formerly used to consume every year about 10,000 quarters of oats, from the port of London, and about 2500 quarters more, bought at country markets, for the horses he kept two or three stages distant from London. Prior to the high prices of last year, he allowed his horses as much corn and hay as they would eat; and, on an average, they consumed 2 pecks or 16 quarts of oats *per day*, and every 20 horses had a load of 18 cwt. of hay *per week*. For the last twenty years, with the exception of the two last, the best hay, (which it was always necessary to purchase for stage-coach horses), might, on an average, be about L.5 *per load*; but last year it rose from L.6 to even L.10 *per load*; and oats this year, (an. 1812), rose from 30s. to L.4 and upwards *per quarter*; at which prices, if oats had been given in the usual quantity, it would have been impossible to carry on the business of stage-coaches. It became necessary, therefore, either to give up that concern, or to hit upon some new mode of feeding horses.

Beans had formerly been purchased, before the new harvest began, at from L.3, to L.3, 10s. *per quarter*. In the expectation of beans continuing at nearly that rate, Mr Willan was led to erect a machine, to be worked by two horses, for crushing beans, and cutting chaff at the same time; and for some time he found considerable advantage from the practice; but beans gradually rose in price, until they reached L.6 *per quarter*. Even at that price, however, he finds it of advantage to use *old* beans, mixed with new oats and chaff, in the following manner: Having harvested well a considerable quantity of oats, it occurred to him that it would be of use, instead of threshing the corn, to cut the straw and oats together into chaff; and now, to each horse, he gives *per day* the following quantities of food, namely, 1. Half a bushel of oat-chaff, amongst which there is probably about a quarter peck of oats, but which must vary according to the season, whether favourable to the production of straw, or

corn; 2. Half a peck of crushed old beans; and, 3. Half a peck of new oats.

This mode of feeding, Mr Willan considers as healthful for the horse, and enables him to go through the severest labour.

The public advantages to be derived, from this mode of feeding horses, are of the greatest importance.

1. The expence of feeding horses, may thus be considerably reduced, the benefit of which is obvious.

2. Even the hardest working horses may thus be fed either altogether without hay, or with a less proportion of it, which will render it unnecessary to keep such extensive and most valuable tracts of land, in a state of permanent grass, when the produce can be so much increased by the use of the plough; and,

3. It will not be necessary to import such quantities of oats; for the quantity raised in Britain, if managed in this economical manner, will be sufficient.

4. Were all the oats raised in Britain not sufficient for this purpose, beans might be used; and all the beans that could be required, might easily be raised on a small portion of the land which is now appropriated to summer fallow; a mode of cleaning land, which, when beans are drilled, in many cases need only be adopted every sixth, instead of every third year, and, in the opinion of some, still more rarely: And,

5. Considerable quantities of oats may thus be saved for the consumption of man.

An eminent coach-master in Lancashire, (Mr Brotherton of Rainhill), has likewise favoured me with some important information regarding his improved method of feeding horses.

He had been accustomed, from 1802 to November 1811, to allow 8 horses, every 24 hours, three Winchester bushels of oats, and one bushel of beans, but no hay or chaff. During that period, he lost a great number of horses every year, to the amount of from 14 to 17 on an average, which he attributes to his having given them too much corn, and more than the stomach could digest. This led him to try a small proportion of hay; and he afterwards adopted the following plan.

To every 8 horses he allows one bushel of oats, one bushel of beans, and three bushels of cut hay, and straw or clover mixed, of the best sort that can be purchased, the expence of which he thus estimates:

	<i>Expence.</i>
One bushel beans,	L.0 12 0
One bushel oats,	0 7 0
Three bushels cut hay, straw, and clover,	0 1 0
	<hr/>
Expence per day for 8 horses,	L.1 0 0

That is, 17s. 6d. for each horse *per week*, besides 5s. worth of hay *per week*, making the expence of each horse *per week* 22s. 6d. A considerable saving thus arises, compared to the feeding wholly with oats, besides a great reduction on the quantity of oats consumed.

Mr Brotherton never crushes his beans or oats, thinking it unnecessary, when the horses get cut clover, hay, and straw, mixed with their corn. But he admits, before they got that mixture, that the beans and oats often passed whole, and it would certainly be advisable to adopt the crushing plan, more especially with very young or very aged horses, as the necessary machinery can easily be had, attached to a threshing-mill. He cuts the hay and straw very short, and gives a preference to clover, if it has been cut before it has been seeded, and is well harvested. He never threshes his oats, if well harvested, but cuts them in the machine altogether. This, howevers, renders it impossible exactly to ascertain the difference of expence between the two systems.

His horses are now as healthy and able to do their work as ever he knew them; and he has only lost one horse since he adopted the new plan.

If he had fed his horses, according to the former plan, at the price which corn now fetches, it would have cost him at least L.1 : 16 : 2 for each horse, *per week*; but according to the new plan, they only cost, as has been already stated, L.1 : 2 : 0, ma-

king a difference of no less a sum than 13s. 8d. on each horse per week, or L.35 : 10 : 8 *per annum*.

Such experiments as these, conducted on a great scale, cannot be too generally known and practised.

2. Besides the articles mentioned in the preceding pages, there are several which might be applied as food for horses, with great advantage, without interfering with the food of the human species. Amongst these, Swedish turnip is perhaps the most useful. Indeed, it has been ascertained by a respectable farmer, (Mr Hope of Fenton in East-Lothian), that by substituting Swedish turnips, for one of the feeds of oats, one-third less hay is sufficient; and that the horses are in better condition, than when they eat corn and hay in any quantity they choose. The utility of carrots is well known. Yams also have been tried with advantage; and a mash of boiled barley in the evening, mixed with the chaff and weaker corn, has likewise been strongly recommended, which promotes the health of the animal, though it may not diminish the expence of his maintenance.

3. The article that, where the crop is abundant, can best be spared from human consumption, and applied to the food of horses, is the potatoe, which, when steamed, is an excellent food for them. Forty-two pounds of potatoes, with cut chaff, will serve a horse for twenty-four hours; and, at any rate, a feed of potatoes, if given to horses, will not only diminish the expence of their maintenance, but is also extremely conducive to their health.

4. When articles of food become scarce and dear, it is extremely material, to discover any mode, not attended with too great expence, by which the article can be made to go farther. Labour, properly applied, in such a case, is not to be put in competition with the advantages of diminishing the quantity of food consumed. Two plans may be adopted for that purpose; either preparing the article for consumption by machinery, or by cookery.

It is well known that a bushel of corn, when boiled or bruised, or a cwt. of hay or straw, when cut, will go much farther than when entire. If a horse is compelled to grind or cut these articles with his teeth, the labour occasions a diminution of strength, and the additional time it requires, lessens that which might be devoted to repose. It is now generally admitted, that the saliva is of less use in promoting digestion, than was formerly believed to be the case; and that this important operation is performed chiefly by the gastric juice from the stomach. If therefore the nourishment is put into the stomach, in a state fit for the gastric juice to act upon it, whether that is performed by machinery from without, or by the teeth within, is of little consequence. Nor is it of less importance, to crush the corn given to horses, whether beans or oats, particularly the former, which becomes extremely hard when long kept. If the gastric juice finds any part of the kernel that it can act upon, by the husk, or outer skin being broken, it will digest the whole; but it ought, if possible, to have that advantage secured to it.

It is likewise found a great improvement, to prepare the food of our domestic animals by cookery. Steaming potatoes is of use, by preventing the deleterious effects of that article, when given in a raw state, by which many horses have suffered; and those who have tried either boiling or steaming chaff and potatoes, or giving their horses a mash of boiled barley, will not be readily induced to give up these practices.

On the whole, these hints are submitted to the consideration of those, who may be desirous of diminishing the expence of maintaining horses, not only for their own sakes, but also with a view of lessening the consumption, and diminishing the price of provisions at present; and of laying the foundation of a system, by which the operations of the farmer may, in future, be carried on, at a less expence, and the importation of foreign produce materially diminished.

December 15, 1812.

No. XXIV.

SOME PARTICULARS REGARDING THE MERINO SHEEP, IMPORTED
BY CHARLES DOWNIE, ESQ. OF PAISLEY IN SCOTLAND, WITH
SOME HINTS REGARDING THE PRACTICABILITY OF THE ME-
RINO'S THRIVING IN SCOTLAND.

BY SIR JOHN SINCLAIR.

THE sheep in question, the number of which amounted to 108 rams, and 146 ewes, left Lisbon on the 10th July, 1810, and they were landed at Port Glasgow on the 6th of August following. During the voyage fourteen rams and four ewes died; but on board of another ship, having also a cargo of sheep, amounting to 150 rams, and 200 ewes, which sailed from Lisbon at the same time, and reached Port Glasgow six days sooner, only eight rams and four ewes died, the vessel being larger and the sheep having more air. Since they landed, up to the 21st August, twelve rams and five ewes of both cargoes have died, and about seven more of both flocks are likely to follow them. During the voyage, they were fed on barley and hay; and care was taken to keep the water, put on board for them at Lisbon, as fresh as possible. The best time to import Merino sheep into this country is, when the weather is most likely to be dry and warm, on their arrival here; and they ought to be brought over in large ships, affording them room and air.

The ram, in a good season, will produce about twelve pounds of wool; the ewe, having had a lamb, about five pounds; having had no lamb, about seven pounds. The wether about nine or ten pounds. The wool was formerly worth only about two shillings per pound; but of late years the price has doubled. The sheep are fed on the mountains of Estremadura in winter, and on

those of Leon in summer. Those imported by Mr Downie are of the Paular breed, which formerly belonged to the Prince of Peace, or Godoy. The reason of their change of pasture is, to avoid the excessive heat of the south of Spain in summer, and the cold of the northern mountains in winter. This change of climate preserves, it is believed, the health of the sheep, and consequently the fineness of the wool.

In Spain, there are many rams without horns, and they could as readily be got over as the horned. The Spanish shepherds, who attend Mr Downie's sheep, have seen flocks of rams without horns; and think that they are in every respect equal to those having horns.

The diseases to which the Merino sheep are chiefly subject are, 1. what in Spanish is called *La Rona*; a disease on the skin; and, 2. what the Spaniards call *Convalencia*; which appears in a tumour, or swelling, under the chin. This is caused by bad grass, or bad water, or by feeding at night, which is reckoned a very bad practice. That disease is incurable. The specific cure for the Rona is the *black oil*, a substitute for which, is water in which tobacco has been boiled. The Merino sheep are also liable to the foot-rot. It is caused by the sheep feeding or sleeping on wet or damp ground. The remedy is the same, black oil, which is called in Spanish *Miera*. It is extracted, the shepherds know not how, from a tree called anevro, which, from their account of it, seems to be a species of fir. The oil may probably be procured from Cadiz, although at some distance from the sheep country. The shepherds do not know whether it be used for any other purpose but for the diseases of sheep.

The Spanish shepherds, as far as they can judge, are of opinion, that the Merino sheep, under a careful and intelligent shepherd, would thrive in Scotland. By an *intelligent* shepherd, they mean one who is acquainted with the various diseases to which the Merinos are subject, and with the cure of these diseases; and who also knows the proper pasture, which should be dry, consisting of natural, rather than of sown grasses, and free from noxious herbs. By a *careful* shepherd, they mean one, who not only leads the sheep to a proper pasture, but who every day ex-

mines them one by one, and is thereby enabled to arrest, in its commencement, any of the diseases to which they are subject: He must also pay the most assiduous attention to his flock, both night and day, during the time the ewes are lambing. With no more care than what is bestowed on sheep in the west of Scotland, they apprehend that many of the Merinos would die before Christmas.

In dry hot weather, salt is given to the Spanish sheep. It is given well pounded, and sprinkled on the plain surface of some stones, which the sheep lick with their tongues. It serves to strengthen and fatten them.

In Spain the rams are put to the ewes in the month of July,—ten or twelve ewes to a ram. If a shepherd has under his care one hundred rams, and as many ewes, he selects about ten of the best of the former, and allows them to be with the latter for a month or so *.

The shepherds spoke highly of the Spanish mutton, and said, though not so fat, it was higher flavoured than any they had seen in Scotland. The best season for killing mutton in Spain, is from April to November. Ewe mutton is not allowed to be sold in the shambles in Spain, it being of a very inferior quality. The ewes are not killed till they pass the age of bringing lambs. The weight of the sheep, when fed on common pasture, is from 50lb. to 80lb. each, (exclusive of the hide, the head, and the entrails), but they weigh more when fattened on rich pasture. They are seldom fattened before they are killed; excepting on the demesnes of the great for their own table. Fattening does not injure the wool; on the contrary, it refines its quality, as well as augments its quantity, at least that is the opinion of most of the intelligent Spanish shepherds.

* It is probable that it is in consequence of their having such a number of rams to select from, that the Spanish shepherds are enabled, not only to keep up, but often to improve the fleeces of their flocks. Such numbers of rams are also kept without loss, from the greater quantity of wool they produce.

No. XXV.

ON FENCES.

THORN hedges ought always to be preferred, when the soil is suitable, or can be made so. They are by far the best fence yet known, and are equally useful and ornamental. They may be “ major at their birth” also, and “ they are getting better every day,” with proper attention, and but little expence. In Berwickshire, they become a fence in 6 or 8 years, and remain so for ever. A stone wall, unless built, or at least *harled* with lime, will generally require an expence equal to the original cost of building during the course of every lease. To make good hedges, they should be reared at the mutual expence of landlord and tenant, and carefully protected till they no longer need protection. After the ditch is thrown out, and the hedge planted, the back of the bank is faced with stones or turf, or a dead hedge is planted on the top of the bank, and often no other defence is necessary. If there is a field on each side, and the ditch is not sufficient to deter cattle or sheep, a paling or dead hedge, on the land side of the ditch, may be required for 3 or 4 years, especially if sheep are pastured in the field.

Upon thin dry lands it is more difficult to rear a good hedge; but where stones are to be had, as they often are on such soils the practice of some of the western counties answers very well, especially when one side is not much exposed. A narrow and shallow trench is opened, and the side upon which the thorns are to be planted is faced with stones about a foot high, or from the bottom of the ditch to the level of the field. A row of sods

then placed above the stones, the grassy side undermost. Upon this the thorns are placed, and another sod or a little good earth thrown upon them. A narrow stone-wall is then built immediately above them, to the height of 2 feet or $2\frac{1}{2}$, commonly of small stones gathered on the field adjoining. Besides the thorns, which were furnished by the proprietor, I have paid for finishing the whole, 4s. and 4s. 6d. *per* rood of 18 feet. All the after expence, is to switch on the breast and top, as seldom any weeding is necessary, and no scouring of ditches. The hedge appears to grow out of the wall, and soon supersedes it altogether.

Hedge-rows are not to be recommended. They may be permitted in small numbers, on the bank of a double hedge. It is a pity they are so injurious, as they give a rich garden-like appearance to a country.

Planting waste spots, and corners of fields, is to be warmly recommended. The trouble and expence of preserving them is, however, a serious objection. In regard to planting the corners of fields, the fence is more an object, than the value of the land, of which there is always a part inaccessible to the plough.

There are other fences which may be shortly mentioned, such as what is called a single dyke, which, when the land slopes much, makes a very good and effectual fence on the lower side, and not a bad one on the higher, unless for sheep. The slope is cut to a perpendicular, and faced with stone, and sometimes a hedge is planted on the higher side. This single dyke is as good as a double one, where only one side is to be defended, as around plantations, and is completed for less than half the expence.

Stone and turf fences are still occasionally put up for temporary purposes; and in some sheep districts, walls of turf alone are yet to be found. Not 20 years ago, these *fauld dykes*, for confining sheep and cattle, on outfield land intended to be ploughed, were not uncommon in the hilly parts of Roxburghshire, and were generally topped with whins, the bushy ends of which hung to the inside of the *fauld*, as a greater security to prevent the escape of the cattle and sheep, for each of which a different sort of dyke was judged necessary.

No. XXVI.**ACCOUNT OF A NEW MODE OF MANURING TURNIPS, AND CULTIVATING BEANS ON LIGHT SOILS.**

BY J. A. KNIGHT, ESQ. NEAR LUDLOW, IN HEREFORDSHIRE.

I had been so much exhausted by preceding crops had not yielded a yard did not contain a sufficient hole of it. I was consequently anxious to try the effect of green fern, which a neighbouring plantation afforded in great abundance, and which was used in the following manner. The fern was cut whilst young and succulent, about the 10th of June, and placed in a large heap or stack, where it soon fermented very strongly. The ground was then formed into small ridges, 27 inches wide, by one bout, that is, by the horses going and returning, with a plough of one mould-board. The fern, which had become black, and partially disorganized by fermentation, was put, as other manure usually is, in the intervals between the ridges, in the beginning of July, and the mould was returned upon it, as it had been taken away by the plough going and returning. The turnip seed was then drilled in over the fern, and the plants grew with great vigour, and produced, generally, a good, and in parts, an excellent crop, but I did not ascertain the amount in weight. It is my custom, whenever I want my turnips to stand uninjured through the winter, to pass the plough backward and forward between the rows, and to throw the mould against and over the roots; which practice I

and, not only to secure the turnip crop, but greatly to improve the barley, and spring wheat, which follows. I give my turnips almost wholly to my cattle, and therefore always cart them off; and as the cart enters at one end of the rows, receives its load, and passes out at the other, without at all pressing upon the ridges, I do not think it ever does much injury, when the turnips have been moulded up in the manner above mentioned. My soil is light and dry, as well as shallow; but I do not conceive that the cart, by passing once only along each row, thus prepared, could do any considerable injury to the strongest soil, provided the water were properly carried off.

After my turnips had been carted off, the mould upon the tops of the ridges appeared, in the end of February, in a proper state to receive a crop of beans, it not having been at all passed over or compressed by the frost, which had been wholly confined to the furrows. I therefore ordered the plough to be passed backward and forward between each ridge, by which means much fresh mould was thrown upon them, and their height was consequently much increased. A single row of beans was then dibbled in upon the summit of each ridge, in the beginning of March, and though the soil was certainly, according to every appearance, very ill calculated for beans, the crop was very good. So many of the beans in the spring had however been destroyed by vermin of different kinds, (the experiment having been confined to five rows, and no other beans or corn having been planted till long afterwards), that I cannot decide what the produce of the crop *per acre* would have been under more favourable circumstances; but selecting a part of the central, and consequently most shaded row, where none of the seeds had been taken away in the spring, I found that the produce of an acre, equally good, would have exceeded fifty-two bushels, statute measure. The sample was very good, and the crop ripened early. I neglected to state, in the proper place, that the ground was kept free from weeds, by the horse and hand-hoe, probably at the expence *per acre* of seven shillings *per annum*. I did not sow the ground with wheat after the beans; but I do not entertain a shadow of doubt, that excellent crops of wheat might be obtained, upon strong

soils, by the preceding mode of management; and the strongest soil might be sowed in good state, in the wettest autumn, by collecting two ridges into one, and sowing immediately. The fern is not now wholly decomposed; but, like the dead and dry fern upon commons in winter, it probably now contains little but carbon, and I much doubt, whether that substance be at all taken up by the roots of plants.

I have stated, in the Horticultural Transactions of last year, in a paper pointing out the efficacy of recent vegetable matter, as manure, that closely adjoining the rows of turnips, which were fed with green fern, other rows were manured with matter, taken from the site of my faggot-pile, which had been collecting during many years, and was formed by the slender branches of trees, having decomposed into a black vegetable mould, and that the crop which was manured with green fern, proved much the best, though the vegetable mould exceeded in quantity, at least four times that which the fern would have afforded, when equally decomposed. This fact, like many others, strongly points out the error of those who think dung should remain in the heap, till the straw it contains becomes rotten.

No. XXVII.

ON A NEW MODE OF DRILLING.

BY MR BEATTIE, OF THE GRAMMAR-SCHOOL, AT MOFFAT.

I BEG leave to communicate to you, as president of the Board of Agriculture, a plan of management, by which I think the agriculture of the country would be greatly improved, and a much greater quantity of corn raised in the country. The me-

thod which I am now to state, I have put in practice, and have found it always answer my most sanguine expectations.

After wheat, barley, or oats, has been sown in the common broadcast way, where grasses are not to be sown, and where the mould is quite pulverized, to begin with the plough, and to throw the ground into drills, just as it were for potatoes or turnip, and let it so remain to bear its crop. This kind of management suits all kinds of seasons: in a wet one, it serves to drain the ground; and in a dry one, so much mould is thrown together in forming the drills, and the seed so well covered, that drought cannot readily injure the crop. In all kinds of seasons the crop will be at least one-third better than when allowed to remain the common way in ridges. Upon a given space of ground, when thrown into drills, there will be about one-third of more surface than when lying flat; and the furrows between the drills act as ventilators; so that, by their means, very rich, strong crops, will keep from lodging, which, upon a plain surface, would fall down, for want of the introduction of a proper quantity of air.

The improvement mentioned, and its utility, was first discovered by me, some years ago, when preparing ground for potatoes, which was in the same field where there was sown corn. The ploughman did not know exactly where the oats began, and, by mistake, went into the corn several drills, which were allowed to remain unaltered. The drills produced at least one-third more crop, than the same quantity of ground any where near them. The same method has been found to answer every kind of ground and season, but particularly wet ground, and such as has a free, light soil; the drilled ground always producing a much weightier crop than the flat lying. The grain also is generally of a better quality, as the crop seldom lodges, even in wet seasons, nor is it apt, by its own rankness, to destroy itself, as the furrows are generally nearly clear of crop.

This method of drilling answers extremely well for winter wheat. In making the ground, when sown in the common broadcast way, into the form of the turnip-drill, the two furrows thrown up to form the drill should not quite meet, but be made so as to

form a hollow in the top or middle of the drill. In this hollow the young wheat is sheltered during the winter, and the rains constantly wash down mould about its roots, which helps to renew and invigorate the plants. When ground is to be drilled in this way, it should not be harrowed severely, lest the seed should be wrought too deep into the ground; and a little less seed will serve. The drill now drawn, must remain untouched to bear its crop. In a short time, I hope to see all wet ground, and such as is of a free, sharp, shallow soil, managed in the way of drill now stated; as I am certain a much greater quantity of corn would be produced in the country.

The following remarks will more fully explain the nature of the proposed system:

The breadth of each drill, according to my system, is about twenty-seven or thirty inches; but a few inches in the drill, more or less, can make very little difference, as seed is everywhere in the drill, and not in regular rows.

I have already stated, in my first letter, that the seed was sown broadcast in the common way, and properly harrowed; then the drill was formed with the common plough, so that the seed is not designed to be in rows along the drill, but any where upon it: and thus a difference of a little breadth can have very little or no effect. As to manure, I have laid it upon the ground or not, just as the kind of crop and ground required, and just as the ground would have been manured or not, if it had been to bear a crop in the common broadcast way. I have never given oats any manure before sowing and drilling them in the way mentioned, but have always manured wheat ground in the common way with dung and lime. I have found oats, barley, and wheat all answer equally well; and I have always used the same quantity of seed when drilled, as when to remain broadcast in ridges. There is no surface lost by the ground being thrown into drills, but rather some gained. I never thought, therefore, of less seed, when the ground was to be drilled. I have followed this system for these three years past, and have always found it answer with the kinds of crops which I tried, namely, oats, barley, and wheat, far surpassing the same kinds of crops, both in quantity and quality,

which were allowed to remain the common broadcast way, though in the same field, and the ground every way equal. By the two inclosed letters, you will see the method has been practised, and is to be put in practice; and I hope soon to see it very common, as I am certain it will increase the quantity of food in the country.

I have the honour to be, &c.

JOHN BEATTIE.

P. S.—Ground of a free, light nature, and liable to suffer by drought, ought by all means to be drilled in the way I have stated, because, by the furrows being thrown together, the soil is greatly deepened for the crop, and cannot be easily injured by drought. Ground also inclined to wet, is greatly benefited by this drill system, being rendered much drier; and the crop upon it not soured by stagnate moisture.

I think there is little doubt, but that if ground was put into a good condition, and seed sown in regular rows in drills, and every way managed in the best manner, it might bear perpetual crops. I should be inclined to put two rows together, only about eight inches asunder; then always between every two a distance of two feet; then plough this space as frequent as it could be overtaken, while the crop would admit. All the intermediate space would have undergone a process of fallowing, and be ready almost for the seed next year: and by shifting the rows of the drills at one side of the field, new ground would always be procured.

No. XXVIII.

QUERIES REGARDING THE CULTURE OF TURNIPS AND POTATOES, IN THE COUNTY OF DUMFRIES.

1. **W**HAT is the usual proportion of potatoes and turnips raised by the tenants in Dumfries-shire?

Answer. As far as I am able to judge, the proportion of potatoes may be about one-seventh of the land in crop. Farmers in general, in this county, are not fond of a turnip crop, as they allege the succeeding white crop is not so good as after potatoes. In my opinion, this is an erroneous opinion, for I have always found, where they were dunged and cleaned equally, the succeeding crop was as good after turnips as potatoes.

2. What quantity of dung is given to each crop?

Answer. About twenty tons per Scotch acre.

3. What is the common produce of each?

Answer. Potatoes about nine tons; white Norfolk and globe turnips about thirty eight tons; Swedish ditto about twenty-seven or twenty-eight tons.

4. What is the average value of each crop *per Scotch acre*?

Answer. Potatoes about L 1 : 10 *per ton*, or L 13 : 10 *per Scotch acre*; turnips about L 10 *per acre*, if the crop is either sold or consumed on the ground.

5. What is the common mode of consumption of each, and the profit thence derived?

Answer. All classes of people live much upon potatoes, and the farmers fatten their swine upon them, mostly boiled, as they have not yet got into the method of steaming them; they also give a feed of raw potatoes (from 7 to 8 lb.) to their horses, instead of a feed of corn. I steam all mine, both for horses, swine, and

poultry, in which I find a great saving. The profit thence derived I have not yet been able to ascertain.

6. What crop is reckoned least exhausting to the land?

Answer. The farmers in general think potatoes least exhausting, and therefore cultivate them in preference to the other.

7. What are the crops which usually follow?

Answer. Wheat sown down with grass-seeds, where the soil will answer; but barley is more generally taken, as the soil in this county is thought better adapted for it.

8. Is alternate feeding with potatoes and turnips ever tried, or twice a-day turnips, and twice potatoes, morning and evening, for cattle?

Answer. I have never heard of its being tried, nor should I imagine it likely to be, as potatoes would be too expensive a food to fatten cattle on.

9. Where pigs are fattened, what quantity of potatoes will produce a pound of pork?

Answer. Cannot be answered at present.

10. In bad seasons, are not potatoes found a great resource as food for man?

Answer. In all seasons they form the chief food for man in this county.

11. Before a pig is finished, what quantity of other articles is necessary to make him thorough fat?

Answer. From four to five Winchester bushels of oats made into meal; and sometimes a proportion of beans and peas, to harden the flesh.

These answers, it is remarked by another correspondent, are correct and intelligent, in so far as respects the immediate neighbourhood of the gentleman by whom these answers were drawn up; but in regard to the county of Dumfries in general, the following observations may be made:

1. That £10 per acre are much too high for turnips, as an average for the county. They are seldom worth more, on an average, than five, six, or seven pounds.

2. That potatoes commonly return twice as much value as turnips, and may be stated at L 15 *per acre*, rising to L 20, hardly ever below L 12.
 3. That feeding stock fat with potatoes is far from unusual; most of the ordinary farmers feed with them, and find them far more nourishing than turnips, the cattle sooner and better fed, and the meat superior.
 4. That if the turnips are drawn, the crop after them is inferior to that after potatoes.
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No. XXIX.

ON THE ADVANTAGES TO BE DERIVED FROM THE CULTURE OF TIMOTHY GRASS.

In September 1801, a small spot of uncommonly rich pasture, in the neighbourhood of Greenock, attracted my particular attention. Upon enquiry, I was informed it was a foreign grass. My curiosity, and the high opinion I conceived of it from what I saw, led me to wish for a little of the seed. The gentleman to whom the field belonged, was good enough to let me have about two ounces from that year's crop, which he told me was the *seventh*. This I sowed next spring, and have been endeavouring to increase my quantity, annually, from that period. The name of the plant was at first unknown to me, but I some time ago discovered it to be the *Phleum Pratense*, named *Meadow Catstail*, or *Timothy Grass*. At present I have about twenty acres covered with that grass, in four fields, and of four different ages; that is, one, two, three, and four years old. Owing to the drought of last year's summer, the seed sown in the preceding spring has not been so productive this season in hay as formerly; yet the pasture is likely to turn out well. The second year's crop, mown on the 29th June last, yielded at the rate of 600 stones, at 16 lb. to the stone, or 400 stones heavy weight *per acre*. That part which is three years old, may be reckoned at 320 heavy stones.

per acre. The remaining divisions, four years old, has been used as pasture, which is both considerably more plentiful, and more to the taste of horses and black cattle, than that of rye-grass sown on the same field, and at the same time.

Timothy-Grass ought to be sown in spring, at the usual time of sowing other grasses, by itself, or mixed with white clover if intended for pasture. I have not yet fully ascertained how far the addition of red clover may be proper. It will grow to the height of four feet on good ground, but would seem to prefer that which is somewhat moist. I have it upon newly improved moss, and dry gravelly ground, on both of which it thrives better, and produces more food than rye-grass; but, from the ground on which I first saw it, I suspect it will grow best on a moist loam, or clayey soil.

This grass, when used as green food, for which it is extremely well calculated, may be cut twice, or perhaps three times, in one season;—when intended for hay, it ought to be cut fully a week before it flowers. Hitherto I have saved seed for myself annually; but from some risk in collecting it, together with the injury done to the hay and pasture, by allowing it to ripen, which it does not do for six weeks at least after the proper time of cutting for hay, it would probably be best to get it from America. It was sold this season in Liverpool at 90*s.* per cwt. From 10 to 12 lb. is enough of seed for an acre.

After a careful observation during nine years, I am now fully convinced that the Timothy is greatly superior to ryegrass, and probably to every other grass as yet generally employed in this country, either as a pasture, green food, or hay; horses and black cattle give it a decided preference, in each of these states, to both clover and rye-grass. It is produced in greater abundance than either, upon an equal space of ground; and the ground has never appeared to suffer in the smallest degree by bearing it.

This grass, therefore, is well worth the attention of every person concerned with agriculture; and I am fully persuaded, that whoever gives it a fair trial, will find it a most valuable acquisition.

ROBERT MUNDELL.

Wallace Hall,
15th August 1811. }

No. XXX.

QUERIES REGARDING LIVE STOCK, WITH ANSWERS.

BY T. A. KNIGHT, ESQ. NEAR LUDLOW, IN HEREFORDSHIRE.

QUERY 1. What is the earliest age at which a cow should begin to breed?

Answer. At two years old.

2. When should a bull be first used in breeding?

Answer. At fourteen months old; but the offspring, if the animal be good, and well bred, will become generally better, till a bull is seven or eight years old, and indeed till his constitution is impaired by age; and this period varies considerably in different animals. I should think a bull not the worse, if in perfect health and vigour, for being twelve years old, though it would not then serve nearly as many cows as a yearling, or two-years-old bull.

3. What parts of the animal are supposed to take after the male, and what after the female?

Answer. If the female be small, and that habit be permanent in her family, the length of the legs of the offspring will be uninfluenced by the male, and will be given by the female parent in the womb, and will not subsequently change. The width and depth, and consequently weight of the carcase, will be greatly influenced by the male; and if the male be of a large kind, the offspring will present great weight in a small compass.

4. On which does the sex of the offspring principally depend?

Answer. I have reason to believe, that in this species of animal, and some others, the sex is given wholly by the female parent; for wherever there is a disposition in the female to produce a great majority of either sex, I have never seen such disposition

counteracted by the male. Two of my cows produced fourteen females in fifteen years, though the bull was every year changed, and each brought a male the same year; but perhaps something may depend upon season and pasture. I have seen, under similar circumstances, a very great number of males to a female; but never quite to the extent above stated.

5. Is it any disadvantage to send a large male to a small female?

Answer. The calves of the improved Hereford breed are generally rather small and neat, and I never saw any injurious consequences from putting such bulls to small cows; but where it has been the practice to rear the largest calves, as bulls, without regard to neatness, I apprehend there might, and would be danger.

6. How does a cross answer, between a Herefordshire bull and a West-Highland cow?

Answer. This cross is excellent. The offspring have the short legs of the West-Highland cows, with the increased weight which might be expected from a Hereford bull. They are exceedingly hardy, their flesh is of excellent quality; and they have, at two years old, nearly the proportions of other stock at six years old; the females are consequently ready to be fattened at two years old. The males require to be one year older, which is uniformly the case.

7. Will the calf require the whole milk of the cow, and how ought it afterwards to be reared?

Answer. Much must here depend on the cow's disposition to give milk, and much upon the quality of the food. The Herefordshire cows generally live upon wheat-straw, with a few turnips, and this food does not ever generate much milk. The calves in Herefordshire are generally weaned when between three and four months old; and some bran and oats are then sometimes given, but not always. No substitute for milk is ever given to young calves; nor do I conceive that any ever will be found, as cheap and good as the milk of the mother, when the food upon which the mother lives, costs the farmer little, as above stated.

8. What may be the price of a good Herefordshire bull?

Answer. From thirty to sixty or seventy pounds for a good yearling bull; from thirty to forty for a similar bull of four or five years old; and from ten to twenty pounds for a calf. I have refused thirty guineas for a perfectly good calf of seven weeks old; but this is, I believe, a solitary instance. About ten guineas for a calf of a month old is a good price.

9. Why is a cross between a Herefordshire bull and a West-Highland cow preferable to any other?

Answer. I prefer it, because the Hereford is a more heavy-fleshed animal than the bull either of the Sussex or Devon breed; and because I am perfectly confident, that a Hereford ox, generally speaking, will fatten in less time, and upon less food, than any other of equal weight.

10. When will the offspring, if an ox, be fit for the butcher, and what may be its value?

Answer. I cannot say, having reared only heifers to breed from; two of these, in the last winter, being then just two years old, (which had lived upon wheat straw and turnips), were valued, by a very excellent judge, at £.20 a piece to a butcher. An ox of this breed, would be perfectly fit, I am quite confident, for the butcher, at three years and a half old, or even at three years old.

11. What should be done with a female calf of this breed?

Answer. I expect the offspring of a half-bred cow of this kind, to afford most excellent oxen and cows, from a Hereford bull; but a half-bred bull of this kind should never be reared, as its offspring would probably be subject to endless variation, from cows of a similar breed, and many would, I expect, prove bad.

12. Can the crossing be extended farther than the first cross with advantage?

Answer. Already answered in the foregoing observations. The male, in such case, should be of the full Hereford, or other improved breed, and not of any mingled breed.

13. What is your opinion of working oxen, compared with horses?

Answer. Vast numbers of oxen were formerly worked in Here-

Fordshire; but as agriculture has improved, their number has rapidly diminished, and is still diminishing. A Hereford bullock, at two years and a half old, taking the average of those which are well bred, and have been moderately well kept with wheat-straw and turnips, is worth about twenty-five pounds or guineas; and after being kept four years longer, its value, if it has worked much, and be only in good store order, will not be above thirty-five or thirty-six pounds. I think that this increased price, with its labour, but very ill repays the farmer*.

14. What is your opinion of the Devon breed?

Answer. The Devon breed of cattle are very pretty, fatten well with good food, and afford excellent beef; but I believe, that according to the quantity of food they consume, they yield less beef than any other breed of this island. My reason for entertaining this opinion is, that I have found the quantity of food animals generally require, to keep them in proper condition, is much more nearly proportionate to their height and length, than to their weight; and the height and length of the Devon cattle are very great relative to their weight. I have seen Devon cows and their offspring, fairly tried with the Hereford breed, by one of my neighbours, who admired the neatness of the Devon breed; but he subsequently admitted, that they would not nearly live upon the same food, which supplied stouter and more compact animals of the same weight.

15. What is the best shape for feeding well with little food?

Answer. The more deep and capacious the chest, and the shorter and lower any animal is, relatively to its weight, the better adapted it will be to live and fatten upon little food; the more labour it will also go through; and I have always found the most short-legged oxen to be the best labourers. Mr Marshall, in his *Rural Economy of Gloucestershire*, also observes, that the best la-

* It is remarked by an intelligent correspondent, “ Wherever cattle are really good, and horses are bred well fitted for field labour, I can venture to predict, that few of the former will be used in countries where cultivation is far advanced.”

bouuring ox he ever saw had the shortest legs. I have lately observed, that the half-bred West-Highland heifers are stronger than the Herefords of the same age; and I am confident, that oxen of this mixed breed, would make most excellent labourers, if they have temper. Those gentlemen who contend, that the contrary make, renders the Devon oxen better adapted for labourers than others, are, I am quite confident, most completely wrong.

16. To what extent is it advisable to carry the fattening of cattle?

Answer. I cannot answer this question with any degree of precision. A few years ago, I should have thought a cow over fatted, which was not more fat, than many two-year-old heifers of the Hereford breed, now become, upon very moderate pasture; and I imagine the improved breeds of other counties, have acquired nearly a similar disposition to fatten, and all are, I imagine, still capable of further improvement. A few animals are at present unquestionably over fatted; but as the bone gains little in the fattening animal, and the other offal becomes proportionally less, as the animal becomes more fat, I am inclined to think, the loss the public has ever sustained, by over fatted animals, very small. Few animals are fatted at so much expence to the farmer as the hog; yet to kill it when lean is exceedingly bad economy. An ox, or cow, whose flesh is of very fine quality, presents, when lean, little but skin and bone; and if slaughtered in that state, it can neither pay the feeder nor the public. A coarse and heavy-fleshed ox, which would require a very long time, and much good food to render it fat, might be slaughtered with most advantage whilst rather lean. It is not the excess of fat, but the want of a sufficient quantity of lean flesh, of which the consumer sometimes complains; and from this defect, of a sufficient quantity of lean flesh, the Hereford ox is not always exempt, though much less defective than the Sussex or Devon breeds.

*Additional Hints regarding Live-Stock.**1. On Breeding in-and-in.*

A correspondent, of whose skill in breeding and experience I entertain a very high opinion, informs me, that Bakewell, many years ago, talked to him of the advantages of breeding *in-and-in*, and he tried it; but he was at last convinced, by experience, that it would not answer. It may do in appearance at first, but by following the system to any length, the stock will get tender and delicate, and be bad feeders, and though they may retain in part, their shape and beauty, they will become lean and dwarfish*. But this is no reason why a breeder may not manage a particular family of animals to great advantage. This may be done, by shifting and changing, instead of breeding directly from parent to offspring. A gentleman who tried the *in-and-in* system with a breed of pigs, informs me, that they got at last into such a state, that the females gave over breeding almost entirely; and if they did breed, their produce were so small and delicate, that they died as soon as they were born. This proves how unnatural such connexions are. *Crossing*, is breeding from a stock entirely different, as from short-horns to long-horns. *Changing*, is when a person breeds from the same sort, but distant in consanguinity, and, if judiciously done, success is certain.

2. On Crossing.

Many intelligent breeders detest all crosses, well knowing the mischief that is done by such proceedings. The first cross between a good short-horned bull and a good kyloe cow, will make a good grazing animal, but by proceeding farther, disappointment will ensue, if a regular stock is wanted †.

* It may be here observed, that any male animal bred in this way, may not have an injurious effect, on the stock of another person, especially the first application, and if the females be of a much coarser quality than the male put to them.

† Mr Bates recommends the cross between the short-horned bull and the kyloe cow. Mr Spearman, another Northumberland farmer, prefers the

3. On Handling.

It is contended, that it is hardly possible to commit to paper the art of breeding first-rate cattle and sheep, though some general idea of it may be given. There is something in the *handling* of both, that can only be learned by practice. Even a short-horned bull or cow, cannot be reckoned a good one, unless they be first rate handlers, let their shape be what it may. Many of them are good feeders; but even that will not make them first-rate animals, unless they are handlers of the first quality. Handling cannot easily be defined. It is said, that the skin and flesh of cattle should feel like a mole, with a little more resistance to the finger. The skin and flesh should be soft and mellow. A tough-skinned animal, must always be difficult to fatten. The handling of a good sheep, should be soft and mellow, and in some degree elastic.

4. On the short-horned Breed.

An eminent breeder is of opinion, that, on the whole, the short-horned breed has been brought to the greatest perfection of any in the kingdom. In this description of stock, the intelligent Mr Charles Colling, late of Ketton, near Darlington, has been eminently successful. His principles, in regard to breeding, are very simple. The success of the art, he thinks, entirely depends on a proper selection of male and female, having an inclination to fatten, which is shewn by the kind mellow touch of the skin and flesh, and a correctness and symmetry of form. These, when united, Mr Colling is of opinion, constitute perfection in the breed of horned cattle. He greatly prefers animals with tall, clean, small-boned legs, thinking that those with short legs have a tendency to dwarfishness. The famous bull Comet, which sold

cross between the kyloe bull and the short-horned cow, after an experience of above twenty years.

Such crosses may, for a time, and by great attention, do well enough; but it is generally found, that great singularities attend such mixtures; and in breeding bulls, though some of them may do, yet their breed is not to be trusted.

for one thousand pounds, belonged to Mr Colling*. Many bulls of the short-horned breed, if exposed to sale, would bring large sums of money. It is common to give one hundred guineas for a season of a good bull.

My correspondent adds, that with proper management, fifteen good short-horned cows will rear from thirty-five to forty calves in one season †; and these calves, if steers, on good keeping, will weigh from sixty to ninety stones, (14 lb. to the stone), at three years old; the females will of course be less. If thorough-bred, and very well kept, the steers can be made thorough fat at two years old. The calves are kept in a fair *growing state*, and not made thorough fat for killing. The milk is taken from them at three months old, and then the calves are turned out on the best meat you can give them. The best for them is the first year's clover, and clover fog; for fine old meadow-land is considered to be too

* It may be proper to preserve the pedigree of this celebrated bull, as a proof of Mr Colling's correctness and success in breeding. Comet was got by Favourite, also bred by Mr Colling. Favourite was by Bolingbroke; and Bolingbroke was from Strawberry, a cow belonging to Mr Robertson of Ladykirk, but bred by Mr Charles Colling, and reckoned of the purest blood.

† This important practice is thus explained: If a farmer keeps fifteen good short-horned cows, he of course expects fifteen calves, (barring accidents). He likewise puts two or three of his *worst* yearling queys to the bull, by which he gains a year sooner than common. If they fall in calf, he feeds them well, which keeps them growing in size. He thus gains from two to three more calves. He then has to depend on the calves produced by the cows of his servants, which he generally takes care shall be got by a good thorough-bred bull. If he cannot thus make up the number he requires, namely, from thirty-five to forty, he purchases the best calves he can in the neighbourhood; and the fifteen short-horned cows will bring up that number of calves in one season, in a way that will make them, when three years old, very fine cattle, if in other respects properly kept. Few calves are allowed to suck the cows, except those intended to be kept as bulls; and nothing but milk is given, when the above proportion of calves to the cows is observed. No doubt, if fewer cows are kept, and more calves in proportion are reared, hay tea, and other articles, must be resorted to.

After feeding that number of calves, a considerable quantity of milk will remain for other purposes.

rich and powerful, at that age of the animal only, being apt to purge them.

5. *On Growing.*

There is another quality very essential in thorough-bred sheep and cattle, which is to be good growers, and to have a good length of frame. The meaning of which is, that the animal should be of a strong healthy constitution, and while it gains flesh and condition, should grow to a good large size. Perhaps, on good land, a steer of 3 years old, when well fed, should be from 80 to 90 stone, 14lb. to the stone; and a two-year-old Leicester wether, from 25 to 28lb. per quarter, immediately when his second fleece is taken from him. The animals should be straight in their back and belly, and their shoulders well thrown back into their crops, and their belly rather light than otherwise. At the same time a gauntness and paucity of intestines should be guarded against, which is a most material defect. Also what may be termed too light of bone, is certainly a great fault. A good grower, or hardy animal, has always a middling-sized bone.

Mr Colling's bull, Favourite, was a singular animal for getting good growers; an excellent quality; one very different from any variety that may take an unnatural or gigantic size, which ought to be avoided.

The great object of the breeder ought to be, to rear stock that will pay the most money on the least food; an object which can only be obtained, by attention to the principles of breeding, and the practice of the most eminent farmers who have excelled in that art.

It may be proper to add, that nature seems to have designed different breeds of animals for different purposes. A heavy Leicester sheep, for instance, was certainly never intended to travel, and to search for its subsistence, on the top of Benlomond*;

* There is sometimes a variety of the Leicester sheep to be seen, with rather little wool and with very thin ears, and full staring eyes. This variety has often no wool on the belly, handles rather hard, and has always a

nor a weighty short-horned steer, in the mountainous districts of the Highlands. Perhaps the thick hides of the long-horned cattle may be necessary to enable them to endure the hardships to which they are exposed in a wet climate. It may be laid down as a general rule, that if a good stock can be obtained, crossing ought to be avoided, for it produces a species of *mule*, and it is more difficult to get rid of the imperfections occasioned by pursuing that system than is commonly imagined.

6. *On Sheep.*

A perfect sheep, I have often inculcated, ought to have five properties. 1. Form; 2. Flesh; 3. Fleece; 4. Fat; and, 5. Flavour. The last property, however, is more to be expected, in sheep fed in a mountainous, than in a cultivated country. In regard to the form, the back should be straight, and covered with meat completely along the back, and upon the valuable points, as the shoulder score, the sides, the twist, &c.

The subject of the breeding and management of sheep, I have already treated of, in a separate publication*; I have now, however, the pleasure of suggesting a certain preventative, and probably an effectual cure, for the foot-rot.

That troublesome disorder is only to be met with in wet pastures, and consequently can only be attributed to moisture. It has often occurred to me, therefore, that it might be prevented, or even cured, by the use of tar applied to the foot, either alone, or mixed with a little butter. Various circumstances have tended to confirm that idea.

1. Upon examining the Spanish shepherds who were brought with Sir John Downie's Merino sheep, to the neighbourhood of

lean back, in so much so that no meat you can give him, will make his back or his loin fat. He has a tendency to very small bone, and rather too much belly, but otherwise he is well shaped. This animal is often found in the hands of ram-breeders, and though a little gay in his appearance, is a very unprofitable sheep.

* See Address to the Society for the Improvement of British Wool, inserted in a volume of miscellaneous essays, printed in one vol. 8vo, an. 1802.

Paisley in Scotland, I was informed by them, that a species of tar was found to be the most effectual cure for this disorder; and, 2. Mr Hogg, the Ettrick shepherd, in his valuable publication on the diseases of sheep, recommends the same remedy. It seems to me, indeed, that there is every reason to expect its answering the object. The tar will prevent moisture from affecting the foot, and, at any rate, it must either destroy, or retain that acrid humour in the foot, which spreads the seeds of the disorder over the whole grounds, where sheep, infected with it, are pastured; and, 3. In the Somerset Report, p. 147. one spoonful of turpentine, and two of crab verjuice, is recommended for the foot-rot.

No. XXXI.

ON AN IMPROVED MODE OF GREASING WHEEL-CARRIAGES, THRESHING-MILLS, &c.

FARMERS should be extremely attentive, to avail themselves of any discovery, that may diminish their expences, or render the instruments of husbandry they use more efficient. I think it right, therefore, to insert in this work, a receipt for making grease, superior to any other hitherto discovered, which was obligingly communicated to me by Mr Crichton, coach-maker, Edinburgh.

Mix, with the ordinary grease used for carriage-wheels, as much black-lead, carefully pounded and sifted, as will bring it to the consistency of any thick soft pomatum, and grease with this.

It will endure twice as long as the grease which is commonly applied; or, if the rotatory motion is not a very quick one, three times as long.

The mixture is equally applicable to machines used in agri-

culture, as mills, &c. It has no bad effect whatever in wearing the axle or box.

The effect is still farther increased, if the axle is iron and the box brass.

No. XXXII.

EXTRACTS FROM SOME OBSERVATIONS ON "THE HUSBANDRY OF SCOTLAND," COMMUNICATED BY SOME ENGLISH CORRESPONDENTS.

Letter 1.

IN reading your publication on the Scotch system of husbandry, allow me to make three remarks.

1. There is no mention made of the draining-plough, the utility of which, I doubt not, you are fully acquainted with. The great benefit meadow-lands, when the subsoil is clay, receives from it, would, I should suppose, from the knowledge I have, been worth communicating to the Scotch farmers, who are unacquainted with it, as far as I found, whilst I was in Scotland, for the express purpose of learning the Scotch husbandry.

2. Urine, which is justly recommended as so valuable, if carted on the meadow-lands, in the same way as the streets in London are watered, would, in my opinion, be disposed of to better advantage, than applying dung or composts; except when lime is required.

3. I have seen South Down sheep thrive in a most astonishing way, on a clay farm, by folding them during the winter, except in the middle of a fine day for exercise, fed on turnips, hay, and littered with straw as often as necessary; if in summer, they were kept in during the nights and bad weather, and not allowed to go out in the morning till the dew was off the ground.

Letter 2.

In regard to the draining-plough, I am well aware that it is of too old a date, to render it necessary for me to enter into a description of it. The benefit derived from it on this estate of the Earl of Uxbridge, is all I can point out, and of which I have been an eye-witness, and assistant to the whole operation.

In the first place, being an expensive implement, and the work that would be required by most farmers of so short duration, I suppose has made it not so much attended to as it ought to have been; and they being generally men who would sooner drag on in the old beaten and slovenly track of their forefathers, and lay out by degrees large sums of money, than adopt a new method on the plea of the cost. I notice this, seeing the difficulty Lord Uxbridge's agents have had to conquer old prejudices. I find Mr Coke of Holkham has noticed the improvements on this estate of the earl's, as being by far better executed than any in England, and as an example worthy imitating. The draining was commenced in the autumn of 1811, and tried on various sorts of retentive subsoils. That which had a mixture of sand or gravel has not answered, but strong clays and marls have succeeded, as far as can be yet judged, to the fullest expectation. The plough was mostly set from the depth of twelve to nineteen inches. The power required has been from twelve to fourteen horses. The pipes were bored parallel if the land was very wet, and as close as would allow the horses, not endangering the one executed.

The quantity drained each day, was, on an average, about fifteen acres, excepting when the windlass was used in small inclosures. A great deal of the estate lays on the banks of the Trent, and constantly becomes much flooded, and therefore for months has retained the water, being nearly on a level with the river; since the draining has been executed, those lands become perfectly dry, as soon as the river gets into its proper channel. The only thing that now remains to be proved is, how long the pipes will last.

I have been informed by Mr Cox of Fifehead, Dorset, that he drained land on his estate, more than eight years ago, and that the pipes remain as good as ever; he has tried it on arable land, and found it of great benefit. The greatest precaution is necessary to keep the mouths of the pipes open by proper tiles, and if they empty into a leading drain, that it should be covered before cattle are turned into the field. This plough is considered only adapted to pasture land, but I am convinced that it would be of equal benefit on arable land, especially on hungry clays.

You will excuse my saying more on the subject, as I doubt the satisfaction I am able to give.

A sheep-cot I shall next endeavour to describe, built on a small farm of Admiral Aylmer's near Windsor, which has been found extremely useful. It was 110 feet square; fed 300 South Down sheep under cover; three sides had sheds; the back of which was twelve feet high, the front three feet and a half; thatched with heath and straw over. Under them racks and cribs were placed to feed ewes or fatten sheep in. The whole was open to the southward, littered with a bed of fern and forest leaves, having a bottom of pounded chalk, on which was first placed moss or peat-earth, then the fern and leaves, next long straw; as this was trod down, a new layer of fern and leaves, and covering of straw was added; and when too deep, the whole carried off to the field, and made into a mass with earth, and sometimes lime, as circumstances required. The area was underdrained every way, and under the drip of the thatch was a regular stone gutter kept clean, the waste water, or draining, passed through the channels into a pit, bottomed with chalk, and covered over the chalk with peat, moss, and small litter; this caught the heavier particles, the overflowings were conducted by carriers over the adjoining meadows.

Turnips and cabbage were served to the sheep in the cot, with a portion of hay, from after-grass. When the weather was fine, the sheep had regular airings on the adjoining meadow, and their apartments cleaned up and made neat. Care was taken, never to give more food than was consumed at once, but they had alway

enough served in several different times. Stalks of the cabbage, leavings of turnips, carried away occasionally, and given to store cattle, or store sheep, or hogs, being first washed. Note—This was an extreme cold clay farm, and no instance occurred for five years, when Admiral Aylmer quitted it, of a sheep having the rot. Bags, like jelly-bags, with salt, were hung up in the cot, which the sheep sucked greedily, and at times fir-shoots, particularly spruce, to eat; which Admiral Aylmer deemed a very excellent medicine to keep away the rot on clay-lands, if aided by salt.

The sheep were also brought into the cot at night in the summer, and not permitted to go out till the dew was off the ground. I must also remark, that the wool became greatly improved, and that there was never an instance of losing a lamb, owing, I was convinced, to the attention of never driving them by dogs, on the contrary, every means was taken to tame them.

No. XXXIII.

HINTS CALCULATED FOR THE USE OF FARMERS IN THE NORTHERN PARTS OF SCOTLAND, WHERE AN IMPROVED SYSTEM WAS BEGINNING TO BE INTRODUCED.

BY SIR JOHN SINCLAIR.

It is certainly necessary, to contrive the means of cultivating the ground, at as cheap a rate as possible, more especially as the wages of servants are becoming higher every day; ploughing, therefore, with a light plough, and with two horses, or two oxen, without a driver, is most earnestly recommended.

Every tenant ought to have the complete and exclusive possession of his own farm; inslosing, therefore, and winter herding, are absolutely necessary.

No tenant ought to take a farm without a sufficient capital.— Prepare that capital before hand, and place no dependence upon credit.

No farmer ought to take more land than he can stock and manage, and indeed ought to have some ready money on hand for bad times. Better to cultivate 50 acres well, than 100 in a slovenly manner.

No farmer should begin without a knowledge of his profession. It requires an apprenticeship of several years to learn the most common trade, and, as farming is a complicated business, a previous knowledge of that art is indispensably necessary.

Endeavour to raise good grain, for it will always sell, even in years of plenty; whereas it is only in dear and scarce seasons, that there is any demand for grain of an inferior quality.

Let your stock of cattle, horses, &c. be of the best sorts, and more remarkable for real utility than for beauty or fashion.

Endeavour to breed your own stock, and be assured that they will thrive better with you than any you can purchase.

Go seldom to market; and when you go, let it be to sell, rather than to buy.

Be not above your profession, and always consider it as the first that any man can follow.

Learn the smallest minutiae of your trade. He will never be a good general, who does not know his exercise.

Consider your landlord as a friend, whose interest and yours, when well understood, are the same.

Keep your land always in good heart. It is both for your credit and your interest to do so, even at the close of your lease. Your next farm will be got on better terms, for every landlord will struggle to get you.

Be not afraid of trying experiments, but let them be on a small scale at first, and few at a time.

Show a good example of industry to your servants. You cannot expect that others will do for you, what you will not do for yourself.

Admit no guest into your house, who cannot live upon the productions of his own country.

Lay up one half of your profits, and live comfortably upon the other*.

No. XXXIV.

ACCOUNT OF A SMALL THRESHING-MACHINE.—WITH AN ENGRAVING.

FROM THE FARMER'S MAGAZINE, NO. 52. 16TH NOV. 1812.

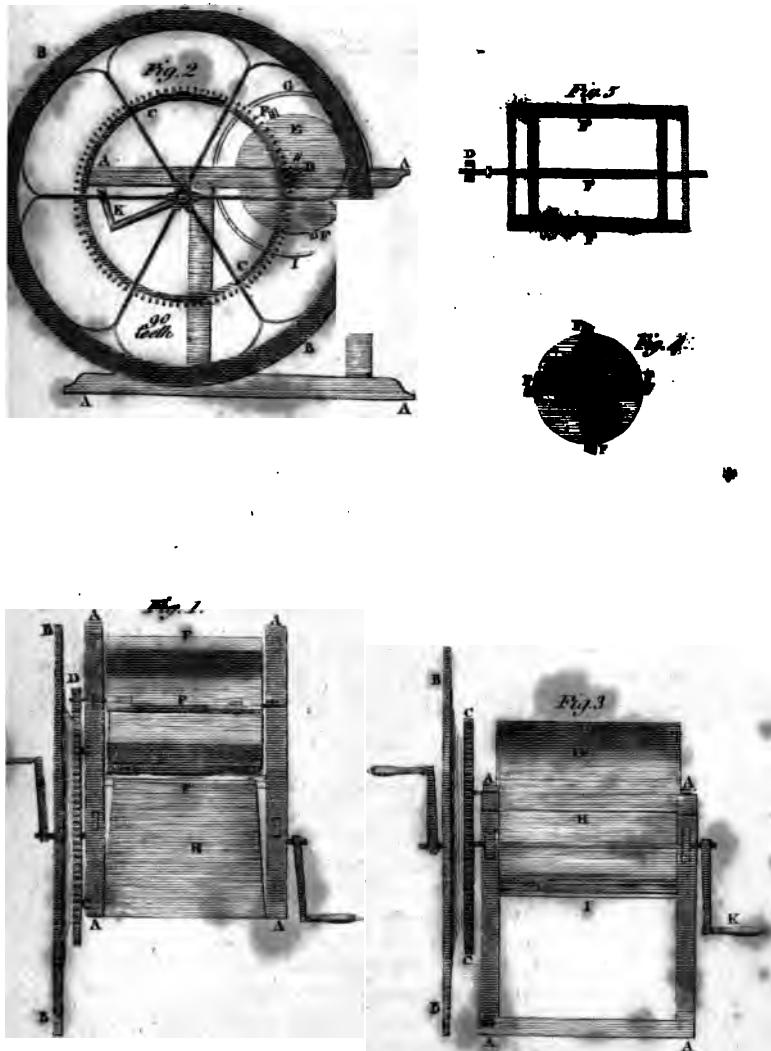
THE threshing-machine is now universally acknowledged to be one of the most useful improvements introduced into the system of husbandry or farm management. The proof of its utility has been sufficiently established, by its very general adoption in the agricultural, and best improved districts of this kingdom.

Whoever had the merit of discovering that grain might be separated from the straw, by a more compendious and effectual method than that of the flail, so long practised in this country, it must be acknowledged, that our countryman, the late ingenious Mr Meikle, had the honour of bringing that machine to its present state of perfection. That such a machine, however, is now brought to the highest state of perfection at which it is capable

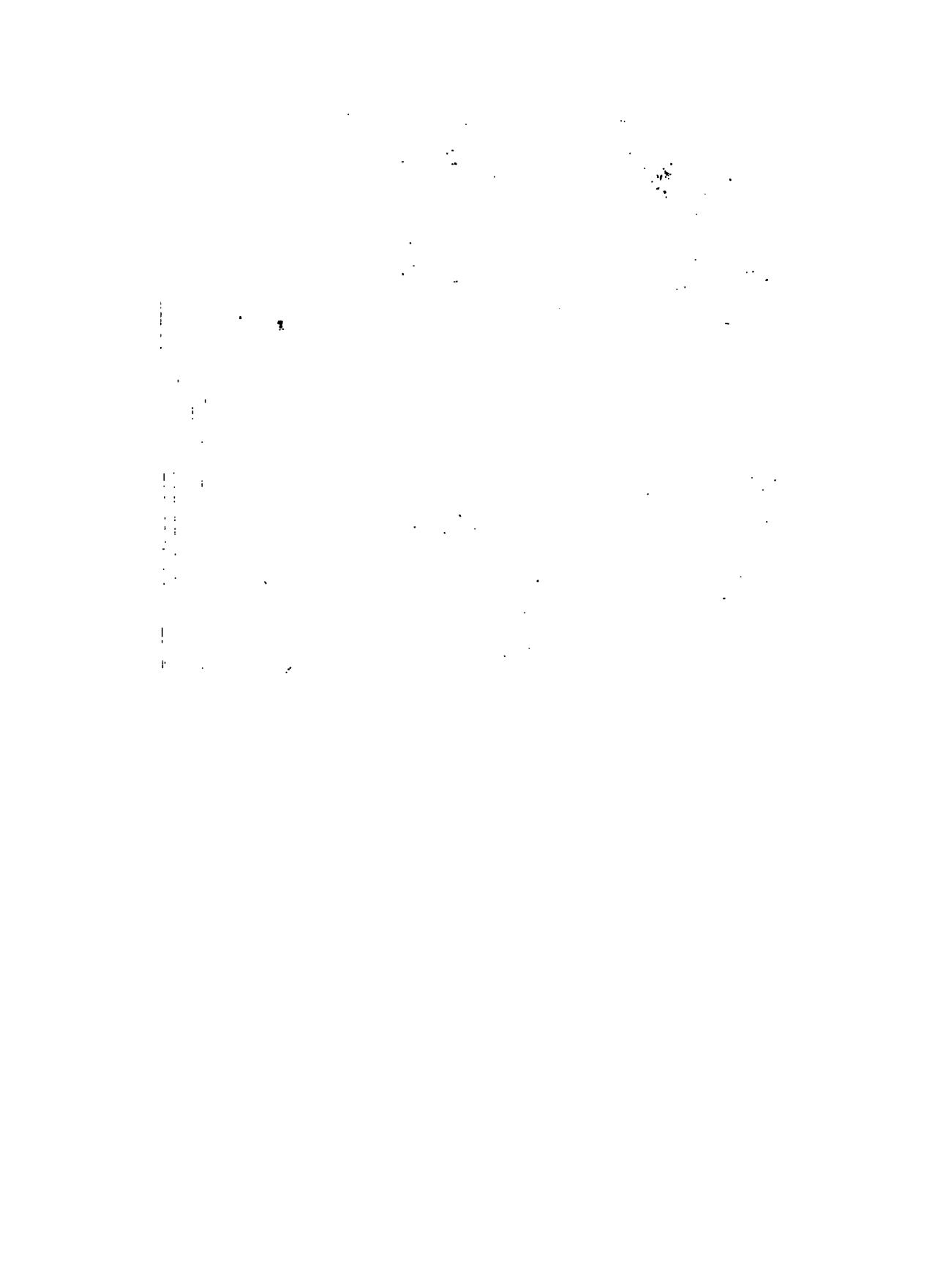
* In order that some of these hints might be better remembered, a few of the most important were versified to the following purport:

Let this be held the Farmer's Creed :
For stock seek out the choicest breed,
In peace and plenty let them feed ;
Your fields sow with the best of seed ;
Let them nor dung nor dressing need ;
Inclose and drain them with all speed,
Extirpate them each noxious weed ;
AND YOU WILL SOON BE RICH INDEED.

Small Thrashing Machine.



Additional self-explanatory expression.



of arriving, would be presumptuous to affirm, and derogatory to that inventive genius, so peculiar to the natives of our own country, who have far outstripped, in this respect, those of the neighbouring states of Europe. Indeed we have only to turn to the last number of the Farmer's Magazine, for a proof of what is now advanced; in which an ingenious improvement is proposed, in the apparatus described, for the more equal application of the powers of two or more horses in turning a machine of this kind.

As the erecting of one of Meikle's machines, to be turned either by horses or water, is attended with a considerable expence to the farmer, a machine of comparatively small expence and power, and consequently suited to the crops of small possessors, has been constructed by Mr William Johnston, an ingenious mechanick in Langholm, which he now furnishes ready mounted for the small sum of L.8, (a draft and description of which is annexed). These machines are turned by the hand, and the quantity of grain threshed by them *per hour*, on an average, is stated to be about 15, or from 15 to 20 stooks of common grain. The number of hands usually employed is—two men to drive the machine, one to feed in, and two to hand the sheaves and clear away the straw, &c.;—but this last part of the operation may be performed by children. In some cases, three persons only are required to carry on the work; namely, one to drive the machine, one to feed, and one to hand sheaves and clear the straw: But the proportion of work performed is in this case considerably less than when a stronger power is given. The proper execution of the work must depend greatly on the dexterity and attention of the person employed in the feeding process. A pair of feeding rollers would probably render this process more perfect; but whether the greater resistance to be overcome, from such an additional apparatus, could be subjected to the same power, is somewhat problematical.

If the proof of the utility of any machine, however, is to be determined by the eagerness of the public to adopt it, the constructor of this small threshing-machine has reason to conclude, that it is very considerable, as he is every day receiving orders,

and from very different parts of the country. Time will soon discover whether his claim to the public approbation has been well merited or not.

Description of the Drawing.

Fig. I. is a plan, or bird's eye view, of the machine—Fig. II. a profile—Fig. III. is an end view or elevation—and Fig. IV. and V. describe the internal parts of the drum, with the beaters fixed on the arms of it.

A A A A represent a strong frame of timber, firmly mortised together with transverse pieces for supporting the large fly wheel of cast-iron, B B, of six feet diameter, fixed on an axle of wrought iron. On the same axle is fitted another cast-iron wheel, C C, of about 30 inches diameter, having 90 teeth in its circumference, which turns a cast-iron pinion, D, of 11 teeth, fixed on the axis of the drum, E, on which are placed the four beaters, F F F F, (see figure 4th). G represents the cover of the drum, H, the feeding board, (fig. 1. and 3.). The dotted line represents the stuff on the feeding board, as it comes to the beaters. The continuation of this line shows the course of the straw under the drum. This course is sparred below, as seen at I, (fig. 2 and 3), to admit of the grain falling down, and separating from the straw which is forced forward by the beaters. The length of the drum, and breadth of the feeding board, is 30 inches. On one or both ends of the large iron axle is fixed a crank or handle, K, which being turned round puts the machine in motion. If this handle is turned round 50 times in a minute, the pinion and drum will revolve 400 times, which gives 1600 strokes of the beaters in the same period. The weight of the whole machine is about 30 stones; and the price, when completely mounted, is L.8 Sterling.

Additional Remarks regarding this small Threshing-Mill.

It is much to be regretted, that these machines are not likely to answer so well as was expected, when the above account was

drawn up. A respectable correspondent in the neighbourhood of Langholm informs me, that the farmers begin to be tired of them, finding the work very laborious, and that it requires more hands than can at all times be commanded. It is said that 3 men and 2 women are necessary, the feeder changing with one of the turners, every five minutes alternately, as they find that ten minutes is as long as a man can turn easily; that, however, may be owing to feeding too fast, and in too great quantities. A farmer in the neighbourhood of Langholm, who has one of these machines, made a calculation of the expence of threshing oats with it, and he found it to exceed what it could be done for by the flail. They continued working for 8 hours, and he attended himself all the time. The labour is considered to be so severe, that some servants will not hire where these machines are used.

It is acknowledged, however, that these machines do their work well, and the objection, in regard to labour, might be obviated, by using the power of water, of an ox or a horse; nor will small farmers, with a numerous family, object to the labour of working them by hand, as it can be done in the evening, and will not interfere with their other labours*. It would be of peculiar importance to introduce this species of threshing-mill, into those countries where labour is cheap, and population abounds, as in the East Indies, and other countries, where, at present, the Asiatic mode of separating the grain from the straw, namely, by the feet of oxen, is adopted.

Some recommend, for moderate-sized farms, a threshing-mill, invented by a gentleman in Stirlingshire a few years ago, but since considerably altered and improved. The machine, altogether, is very simple; it threshes with scutchers, somewhat similar to the lint-mill. It is said to answer well for all sorts of grain, and for barley in particular. The expence is from L.28 to L.30, when driven by water.

* In some new ones made by Mr Gutzmeer, engineer, Leith Walk, Edinburgh, the handles are made to suit four turners, which removes all objections to this machine, where population abounds, and labour is cheap. He thinks they may be made, so as to answer with only two turners, and to thresh 8 bolls per hour.

It may be proper here to add, in regard to threshing-mills in general, that it is a great advantage in constructing them, to have cast-iron segments, screwed upon cast-iron segment-blocks. In the first place, the cast-iron segment-blocks do not rot, and are not liable to twist and warp, as wood. In the second place, the expence of a cast-iron block, is not half the expence of a wooden block sixteen feet diameter; and in the third place, if one of the cast-iron segments is broken, it is easy to screw on another; for which purpose, some spare ones should always be sent, more especially to remote districts.

No. XXXV.

ON THE NATURE AND CAUSES OF THE BLIGHT, THE RUST, AND THE MILDEW, AS AFFECTING CROPS OF GRAIN.

BY SIR JOHN SINCLAIR.

THE following observations are the result of a very extensive enquiry, into the nature and causes of these distempers, made towards the end of August, and the beginning of September, 1808, at which time, blight, rust, or mildew, had affected the crops of many of the most productive districts both in England and Scotland. A pamphlet, containing in all 134 pages, was then printed on the subject, of which the following is an abstract, and to which the reader, who may be desirous of obtaining more detailed information upon the subject, is referred *.

* See Result of an Inquiry into the Nature and Causes of the Blight, the Rust, and the Mildew, by Sir John Sinclair, Bart. Printed for Constable and Co. of Edinburgh, and Cadell and Davies of London. An. 1809.

It is proposed to consider, 1. The nature and causes of these disorders; and, 2. The means of preventing them.

I. On the Nature and Causes of the Blight, the Rust, and the Mildew.

There is no plant grown in Britain so liable to disease as Wheat. This may be easily accounted for, from the circumstance of its being introduced into this country from a better climate, where the seasons are more regular, and less subject to wet and cold, the principal sources of those disorders to which this species of grain is liable; and where, however strange it at first may appear, the wheat is exposed even to less heat; as, in the more southern climates, it is in general ripe, or out of danger, before the more violent heats commence. From the abstruseness of the subject, the real nature and causes of these disorders have not as yet been fully and accurately ascertained. Indeed, they are sometimes to be ascribed to various causes, operating at the same time; and the same plant may often be affected with different disorders; but, on the whole, they have been attributed to one or more of the following circumstances. 1. Heavy rains: 2. Fog, or mist: 3. Dew, or gum: 4. Frost: 5. Heat: 6. Lightning: 7. Calm weather: 8. Inclosures: 9. Improper manuring: 10. Too frequent repetition of wheat crops: 11. Soil: 12. Elevation and exposure: 13. Insects; and, 14. Fungi, or parasitical plants.

1. *Heavy Rains.*—The generality of those who have communicated to me the result of their observations regarding the causes of the diseases of wheat, in the course of the last season, have attributed them to wet weather, and heavy rains, which commenced about the end of July, and continued, with very little intermission, for several days. These rains are represented, as having prevented the process of maturation from going forward; as having washed away the *pollen*, or *farina fæcundans*, which prevented the florets from being fecundated; as keeping the roots of the plants in many soils in so wet a state, that it occasioned an abortion in the year; and as frequently lodging the corn; in which case, unless elevated again by the wind, it could

never reach maturity: In short, that mildew is owing to wet, damp weather, and the straw being filled with moisture.

These observations are corroborated by other evidence. For instance, Du Hamel states, that heavy and cold rains, when the corn is in bloom, may hinder the grain's being impregnated; as happens under similar circumstances to grapes, which then remain small, and without juice. According to Tull, long-continued rains rot and chill the blossoms of wheat, and prevent their fertility. Dr Home justly observes, that too great abundance of juices, must occasion stagnation, corruptions, water-shoots, &c. Mr Lambert states, that it is in wet seasons the wheat is the most injured by the fungus, particularly the grain that grows in low grounds; and a respectable friend of mine (George Dempster, Esq. of Dunnichen) informs me, that his wheat turned out a miserable parcel of shrivelled stuff, neither injured by mildew or the smut, but that its bad state is entirely to be imputed to heavy rains, when in flower, by which it was laid; for the little that stood, is rather better than the rest. Darwin observes, that draining the ground, and sowing early, so as to procure forward crops, must be of great use, as the late crops are often injured, owing to the greater dampness of the ground in autumn.

2. *Fogs or Mist.*—Not only heavy rains, but even fogs and mist, have had the same effect of producing diseases in wheat, more especially when the weather is hot, and accompanied by little wind. There are two sorts of those fogs, one of which comes from the sea; which, though very thick and strong, yet it would seem, that it does not injure the crop near the sea-shore, though it occasions considerable injury in the more inland parts of the country. The other fog arises out of the ground. It is called in some parts of Scotland, the *ground rook*, (probably reek or smoke), and strongly resembles a thick smoke, arising from the surface of the earth.

Other evidence supports the same idea. According to Du Hamel, the rust is owing to dry *gloomy* weather happening when the corn is at the height of its vegetation. Tull observes, that the rays of the sun are necessary for keeping the wheat healthy and strong, as it is doubtless the native of a hot country: Any thing,

therefore, that interrupts the rays of the sun, must be injurious to that grain. And in America the mildew is attributed to the fogs and heavy dews, which come on, as the season advances. Sometimes the fogs and mists are so close and thick, that the air seems in some degree to have lost its elastic powers, so that neither animals nor vegetables can thrive in it.

3. *Dew or Gum.*—It is certain that plants are frequently injured, by a dewy moisture which falls upon them. That moisture may be described, as a composition of all the watery, oily, and saline vapours, which exhale from the earth or the sea, which in the day-time are kept suspended by the heat of the sun; but during the cold of the night, fall to the surface of the earth, and are deposited on the leaves of trees, upon the ears of corn, &c.; and being of a clammy and glutinous nature, they check the perspiration of the plant, hinder the circulation of the nutritious sap in the proper vessels, and bind up so closely the tender years of wheat, as to prevent their growth, and the filling of the grain or pickle. As water-mills are commonly placed in very low situations, and as such dews are usually exhaled from flat grounds, and are generally again deposited upon them, hence probably originates the name of *Mildew*. Home describes this dew, as a gluey saccharine matter, falling with a summer shower, and blocking up the perspiration of the plant.

In an interesting communication from the county of Caithness, the mildew is attributed to a close gluish fog, of a whitish colour, which arises from stagnated water or swamps, and discharges itself in the low ground, according to the direction it takes. It immediately stops the vegetation of the grain, if it is in a milky state; and, in the course of ten hours, the ear begins to look bleached, and of a pale white. The straw is affected by it as well as the ear. If there is a sunshine next day, the damage is certain; but it does little mischief, if there is damp, or rainy weather the day following.

4. *Frosts.*—The Reverend Mr Nesfield was of opinion, that the mildew was owing to frosts in the end of spring and beginning of summer, more especially if they took place between the 20th of May and 10th of June; at which period, in Suffolk, where

he resided, the wheat is pretty far advanced upon the spindle. But this theory is completely overthrown by the facts collected by Mr Arthur Young, regarding the crop of 1791, when, notwithstanding very severe frosts at that period of the year, the crop was not at all mildewed. In fact, it is not spring or early summer frosts, but late summer and autumnal ones, which occasion the mischief, unless sometimes black frosts in the spring, which are destructive, from the dry state of the air, by which the moisture of the vegetables is extracted out of them.

In regard to the effects of autumnal frosts, there is sufficient evidence of the mischief which they occasion. At the same time, it is to be observed, that plants receive injury by frost, in proportion to the quantity of sap contained in them, or the aqueous particles that rest upon them; hence a severe frost has less effect on a plant in dry weather, than a less degree of frost in rainy weather, or when heavy dews fall. Wheats, therefore, with large porous stalks, which absorb a great deal of moisture, are more liable to injury, than those which have a smaller and more solid stalk. The injury done by frost also, depends much on the temperature and brightness of the succeeding day. Should it be cold and gloomy, the injury is less; but if the day is warm and bright, the leaves of the vegetable become black, and never revive, the effect corresponding to the degree of the returning stimulus.

5. *Heat.*—Others attribute the disorders of wheat to excessive heats, which occasion the plants to suffer from a privation of nourishment, and to become sickly and feeble; and, in the opinion of a most intelligent farmer, (Mr Boys of Betshanger in Kent), the failure of the crops of wheat this year, was owing to the four days of extreme heat, from the 11th to the 14th of July inclusive, when the thermometer in the shade stood on those days, at noon, from 90 to 94 $\frac{1}{2}$, and against a south-east wall, in the sun, from 124° to 130°. In a letter to the author also, Mr Money Hill of Waterden, one of the most respectable farmers in Norfolk, attributes the uncommon lightness of the crop this year, to its becoming prematurely ripe, at least three weeks before its proper time, owing to the great heat in the last week of July and the first week of August. Mr Grierson likewise ascribes the

high prices of grain in 1795, to the long drought and violent heats in England in 1794, which materially injured the whole of the crops in Norfolk and Suffolk. This source of disease, however, is not so much known in Scotland as in England, our summers not being so warm, and being oftener accompanied with rain, which is an immediate antidote to the evil. At the same time, I found, that the farmers in the Carse of Falkirk did ascribe any failure in their crops of wheat to great heats, previous to the heavy rains.

It appears, from the preceding observations, that great wetness, cold, or heat, are all of them capable of producing mildew. When, therefore, the weather is variable to any extreme, and more especially when there are sudden transitions from heat to cold, and that attended, perhaps, with a long continuance of wet weather, it is not to be wondered at, that the crops of wheat should become generally diseased. It is probable, indeed, that a considerable part of the injury is done, many days, if not weeks, before any diseased appearance is discovered in the plant itself; and that the injury may be ascribed, not to any one cause, but to the variableness of the weather.

6. *Lightning.*—Tull has observed, that, among the other accidents which either kill the plants entirely, or injure their health, (in which case the grains are not filled), lightning is to be included, the effects whereof may be observed, by the blackish spots and patches, in fields of wheat, especially in such years when thunder-storms are more than usually frequent; and this doctrine has acquired an additional degree of probability, since the discovery of the great effects of electricity, with which the air is so abundantly stored in stormy weather. These observations are confirmed by the information of a respectable correspondent in the county of Durham, who states, that patches were observed in different parts of the field, without any grain in the ears, *and the fields appeared to be injured in a zig-zag direction, as if by lightning.* Darwin also, in his *Phytologia*, states it as his opinion, that the blasts, or mischief occasioned by lightning, are more frequent than is usually supposed.

7. *Calm Weather.*—The necessity of air for the life and health of plants, cannot be questioned; for the air carries off the moisture from the leaves, after the wind has shaken off the dews and dew-drops, which would otherwise suffocate the plants. Mr Grierson, however, has justly observed, that nothing is so destructive to plants in calm weather, in all the periods of its growth, more especially when it is in flower; for even then, wind, unless it is very violent, has but little effect upon it. In ordinary years, we have winds from the west, which beat off any mugginess in the atmosphere, and in the ears of the plants. But he adds, that unfortunately there was one day of a powerful wind from that quarter in the year 1825, to the want of this wind, that the failure of the summer crops is to be ascribed. It is indeed the only year, since the year twenty-five, that we have had no summer gale from the west, not even in the months of February and March. It is the wind that promotes the growth of plants, as it is from the wind that the circulation of that fluid, that they are supported, is brought to perfection. The moment it stands still, no further growth is made, and the plant dries up and dries up.

8. *Inclosures.*—The effect of inclosures, either in preventing, or occasioning mildew, is a subject that has been disputed. Much depends upon the nature of the country, and the circumstances which occasion the malady. In hot climates, large and open cultivated fields, are less subject to blight, than inclosures of almost any dimensions, which prevent the free admission of air; and such fields also, produce a brighter and heavier sample than inclosed land. But, on the other hand, in colder climates, where the grain is apt to be injured by frosts, trees and hedges are said to have a wonderful effect, in preventing tender plants from being injured by summer frosts; 1st, By intercepting the cloud of vapour which generally moves up the rivers in a calm evening, when the weather is fine; and, 2d, By screening the crops in their neighbourhood from the influence of the morning sun.

It is observed, at the same time, that the close neighbourhood of high hedges, thick trees, and plantations, evidently increased the evil consequences of the disease, preventing the beneficial

influence of the wind, by means of which the wheat, when lodged, might be raised up.

9. *Over-manuring*.—There is no point, connected with the present enquiry, which it is more necessary to inculcate, than the danger of *over-manuring*, or having the land in too rich a state for crops of grain. The greater quantity of sap and juices in vegetables growing on highly-cultivated soils, render them more susceptible of the effects of sudden and extreme changes, and, consequently, more liable to be mildewed. It renders the straw too luxuriant, more porous, and consequently more liable to be filled by aqueous particles, which, if any frost should happen, must prove injurious to the plants. It appears, that even the sea-air is no preventive against the mildew, when too much manure is applied; a field at the very gates of Dunbar, a sea-port town on the east coast of Scotland, being completely mildewed, for which, the only reason that could be assigned, was, *an excessive manuring*, after being summer-fallowed, whereby the juices of the plants were properly vitiated, and rendered liable to disease; as commonly happens with wheat sown on the site of a dunghill, *which rarely escapes mildew even in the most favourable seasons*.

Nor is this to be wondered at. It is well known, that mushrooms are produced on beds of dung; great quantities of manure therefore, must promote the growth of fungi, or parasitical plants, on the crops of wheat. When the plants also are too luxuriant, and full of sap, by over-manuring, they are more apt to be injured by frost; and when too thick, to be laid by heavy rains.

In order to remedy the mischief of over-manuring, as a cause of mildew, it is recommended, to lay on the dung early, so as to admit of frequent ploughings, before the grain is sown. Sheep-folding is also recommended, as a better preparation for wheat than muck, and lime as preferable on heavy soils, and marle on light ones. At the same time, it is to be observed, that, by the use of much shell-marle, the ground becomes dry and loosened; heat will then have a more powerful effect upon it, the stalk obtains no nourishment, and becomes so weak, that, if any rain comes, the plant falls down, and the ear is seldom filled.

10. *Too frequent Repetition of Wheat Crops.*—1. It is stated by an intelligent author, (A. B. Lambert, Esq.), who wrote in the year 1797, that it is only within these few years that the mildew has been noticed in the west of England, or at least that the wheat has been known to be injured by it; and he puts this question, “ May it not proceed from the land being too much worked, and not having that rest given it which it requires?”

The same observation may be made in regard to the districts to which this paper principally relates, viz. the counties on the borders of England and Scotland. There, the mildew was hardly ever known to any extent, till within the last few years. It was formerly confined, for instance, to six farms, in the parish of Sedgefield, in the county of Durham, the soil of which was a weak, poor, deaf, wet clay; but the disease has, of late years, been spreading in that parish to other fields. During the last fourteen years, the mildew has never caused any remarkable injury in Berwickshire, so as to occasion much speculation or enquiry. In the year 1807, only some instances occurred; this year, however, it has been universal and fatal. It is only within these two or three years past, that it has made its appearance on Tweedside, or in Roxburghshire. In the Mearns, and other northern counties in Scotland, where the culture of wheat has only been recently introduced, it is but little known. In Sussex, it is complained of as an increasing evil.

There are some soils, which certainly will bear a more frequent repetition of crops of wheat than others. Where clay predominates, the crops are in general the least affected by the mildew. Peat or moor, calcareous soils, calcareous loams, sand and sandy loams, have been found, in that order, to be the most liable to have their produce injured by the blight or mildew. Where the soil is sound, as clay, strong loam or gravel, the failure, even this year, was more in quantity than in quality.

11. *Elevation and Exposure.*—The situation of a field, in regard to elevation and exposure, has also a material effect, in promoting, or preventing, the diseases of the grain therin raised. Low-lying fields, are apt to have diseased grain, owing to the want of a free

circulation of air, whilst high grounds, like those of Glendale in Northumberland, are exempted. Nay, in the very same field, the hollow part of it has always been mildewed, owing to the water being retained there, or because more vapour, from the dampness of the ground, was exhaled from it; whereas, in the upper part of the same field, where there was less vapour, and where it was more exposed to the influence of the wind, by which any vapour was dispersed, no injury was sustained.

In regard to exposure, one circumstance has been reported to me, on very respectable authority, that of Mr Money Hill, that wherever he had a field affected, either in this or former years, it has universally been, either in an eastern or western direction.

12. *Insects.*—As there is hardly any thing, either in the animal or vegetable creation, that is not infested by some vermin or other; it is not therefore to be wondered at, that maggots, or insects, should be found connected with the diseases of wheat; and as this is a point of considerable importance, it requires to be more fully elucidated.

Some naturalists are of opinion, that insects do not attack either plants or animals, unless they are previously in a diseased state; and they assert, that the first step towards putrefaction in either, is a well-known invitation to numerous tribes of insects. But unfortunately, this does not seem to be the case with wheat.

This important subject has only of late been sufficiently illustrated, by some intelligent, and public-spirited members, of the Linnean Society of London.

In the Transactions of that useful institution, several papers are printed on the subject, from which it would appear, that various maggots or insects injure our crops of wheat; but that the principal are, the wheat-insect or *ear-worm*, as Dr Coventry calls it, (*Tipula Tritici*), and the *Thrips physapus*. The former produce small yellow larvæ, or maggots, which becomes short, thick, black flies. These larvæ, it is conjectured, may feed on the *farina*, or male dust of the stamina, and may possibly prevent the proper fertilization of the pistil, in such a manner as to occasion the future grain to be shrivelled and imperfect. Others imagine, that the fly in general does not make its appearance until the

spring, so as to be in readiness to deposit its eggs in the wheat, when it has made so much progress in growth, that the larvæ may be hatched about the time of its going into blossom. Mr Kirby observed, on the 3d of June, 1778, an innumerable host of the *tipulæ*, flying about in all directions in the wheat fields. They are seldom to be seen before seven o'clock in the evening; at eight o'clock, the field appeared to swarm with them; at which hour, they were busily employed in laying their eggs in the florets of the wheat; about nine o'clock, they generally disappeared. About the 29th of June, the parent *tipulæ* were no more to be seen. Some naturalists are of opinion, that the *Tipula Tritici*, or wheat-insect, and the *Tipula pini*, or fir-insect, are the same; and it is a singular circumstance, that in a field where the upper part was near a plantation of firs, the wheat was much affected; but considerably less so at a distance from the plantation.

The *Thrips physapus* also, does considerable mischief to the wheat. It takes its station in the longitudinal furrow of the seed, in the bottom of which it seems to fix its rostrum; it probably sucks the milky juice which swells the grain; and thus, by depriving it of *part*, and in some cases, perhaps, of the *whole* of its moisture, occasions it to shrink up, and to become, what the farmers in some parts of England call *pungled*. It is a mistake to suppose, that only a single pickle in an ear is injured by it. In many years, a fourth part of the grain was either destroyed, or materially hurt; and Mr Kirby reports it as the conviction of a very intelligent farmer, that this insect, occasioned what was called a *blight*, in a year when the crop was peculiarly defective.

The destruction effected by these insects would be immense, and incalculable, were it not that they are fortunately liable to the attacks of a number of enemies, who devour them, (as many small birds do), or who destroy their larvæ. The destroyers of the larvæ are different species of the *Ichneumon*. Mr Kirby, in the course of his interesting enquiries, discovered three different species of ichneumon, each of which, by separate means, attacked the *Tipulæ Tritici*; and thus set bounds to the ravages of an insect, which, however insignificant it may seem at first sight, might, if permitted to exceed its due limits, deprive us of the

staff of life, and might almost occasion the destruction of our species.

In regard to the crop of this year, several of my correspondents mention their having seen the yellow worm or maggot; but others deny the existence of this cause of mischief altogether. It is impossible, however, as Dr Douglas observes, to deny positive evidence; and wherever the ear is only partially filled, it was probably owing to the attacks of those insects.

13. *Funguses*.—But dreadful as is the injury done by insects, it was nothing compared to the total destruction effected by fungi or parasitical plants, by which whole fields were utterly destroyed, so as not to contain a single grain of wheat in the ears, and the straw was rendered totally unfit for fodder, or little better than a *caput mortuum*, possessed neither of strength nor substance.

Sir Joseph Banks observes, that botanists have long known, that the blight in corn is occasioned by the growth of a minute parasitic fungus, or mushroom, on the leaves, stems, and glumes of the living plant, which intercepts the sap intended by nature for the nutriment of the grain, and the corn becomes lean and shrivelled.

Among the foreign authors who have written on this subject, Fontana is perhaps the ablest and most intelligent. After discussing all the theories of other naturalists, he states it as his decided opinion, that the mildew of corn is nothing more than a collection of parasitical plants, which, though small, yet in number surpass all conception, and are productive of the most terrible evils; for when the leaves and stalks are attacked by them, the most beautiful crops, which promised a plentiful harvest, are reduced to little or nothing, because so many greedy and voracious plants, in so many places, absorb the whole nutritive juices of the corn, which, being deprived of its alimentary chyle, is quickly enfeebled and wasted.

Darwin takes notice of the mildew, among the other diseases of plants, and does not hesitate to say, that it is a vegetable substance, of the fungus kind, which, like other fungi, will grow

without light or change of air, having its roots fixed in the vessels of the vegetable, to which it adheres. He adds, it is most probable, that these fungi never attach themselves to plants which are not previously diseased. Many other British authors have endeavoured to investigate the nature of these fungi, and made considerable progress in the enquiry. Some naturalists have given this fungus or mushroom the name of *Uredo frumenti*, and contend, that it is often long sown on the stem of the wheat, but remains imperceptible and unknown, unless that kind of weather occurs, which is favourable to its vegetation. A knowledge, however, of this class of vegetables, is still in its infancy, and many years must elapse, before it can be put on the same firm footing with the other branches of botany. It may be observed, at the same time, that there is scarcely a leaf (at least of trees and shrubs), which falls to the ground, that has not its peculiar fungus, which, assisted by humidity, reduces it to its original earth.

In regard to the existence of fungi, as injurious to this year's crop of wheat, the evidence is distinct and conclusive. From Yorkshire, it is stated, that as the wet weather continued, the rust or fungus made a rapid progress, from the ear downwards, until, in many instances, it covered the stem from the ear as far as it was unsheathed. In Durham, thirty-nine out of forty-five acres were mildewed. In Northumberland, the rust or fungus prevented those grains, which the maggots had not destroyed, from being perfected, in a greater or less degree. In Berwickshire, the parasitical lichens multiplied so much upon the straw, and on the husks and chaff of the ears, that, in many instances, whole fields put on an universal blackened appearance. In former years, the mildew was only partial in Roxburghshire; but this year it extended over every situation and soil, and over every field, whether inclosed or open.

Before the subject of fungi is dismissed, it may be proper to allude to the influence which the barberry bush is said to possess, of producing a most noxious effect upon corn, and particularly upon wheat and oats. This has long been asserted, and has recently been confirmed by additional evidence. In Mr Young's

Report of Essex, we are told, that Mr Sewell, on purchasing a farm, and sowing wheat in one of the fields, found the crop mildewed in two directions; and asking a labourer if it was subject to that distemper: " Oh !" replied the man, " it is in such, and such a line, and in that direction you will find two barberry bushes, which always mildew some of the wheat whenever it is sown." Mr Sewell grubbed up the bushes from the hedge, and after that saw no more mildew.

In the Agricultural Survey of Cheshire, it is reported, that a young plantation was fenced, for about 100 yards in length, with a barberry hedge: in consequence of which, three crops of grain sown in its neighbourhood were affected with the mildew, whilst all the corn, in the same neighbourhood, was at least as productive as usual. Naturalists are not agreed as to the cause of the effects produced by the barberry. Sir Joseph Banks thinks it possible, that the parasitic fungus of the barberry, and that of wheat, are one and the same species, and that the seed is transferred from the barberry to the corn. It certainly is a singular circumstance, that the barberry should have such an effect, but it is impossible, at the same time, to resist such positive testimony.

I have thus endeavoured, briefly, to state a number of interesting facts, and to explain the sentiments of several intelligent authors regarding the principal diseases of wheat. On the whole, it seems to me, that when they do not arise from any accident, as lightning being lodged, from heavy rains, or falling down from the lightness and poverty of the soil, and the consequent weakness of the stem, when the crops are not injured by frost, or burnt up by heat, those diseases may be classed under three heads,—1. Mildew ; 2. Blight ; and, 3. Rust.

*Mildew** is a saccharine gummy substance, deposited on the ears and stems of plants, which, by stopping their perspiration,

* The French call mildew, 1. *Nielle*, or, 2. *Serein*. *Nielle* is defined in Boyer's Dictionary, " a kind of fog or mist, which attaches itself to corn,

destroys the whole vegetable. It is well known, that a tree would perish, if all its leaves and branches were kept constantly covered with gum; and this dewy deposition has a similar effect on the ears and stems of grain.

Under the term *Blight*, may be included the destruction effected by insects, and the maggots from which they are formed*,

Under the term *Rust*, may be included the destruction occasioned by funguses or parasitical plants.

If it were possible once for naturalists to agree upon the terms they use, by adopting these, or any other definitions, their reasonings would soon become more distinct and conclusive.

We shall now proceed to consider, whether any means can be thought of, either to prevent entirely these dreadful disorders, or to diminish the fatal consequences which result from them.

II.—*On the means of preventing the Mildew, the Blight, and the Rust in Wheat.*

Many are of opinion, that the diseases of wheat are owing to the soil,—to the seasons,—to atmospheric influence,—or to circumstances which the power of man cannot controul; consequently that it is in vain to look out for any preventive or cure. Such ideas cannot be too loudly reprobated. Upon the same principle, we ought never to attempt to cure the diseases to which the human species are liable, or to think of preventing them by inocu-

when the grain or pickle is forming, and renders it black." *Serein*, "a dampish or unwholesome vapour, that falls after sunset in hot countries; a sort of mildew." *Rouelle*, or rust, is described as a malady "that attacks the stalks and leaves of varlous plants," and is probably the same with the Latin *rubigo*.

* Tull says, that wheat is blighted at two seasons; one when in blossom, and then its generation is prevented, and many of the husks are empty in the ear, the grains not being impregnated.

Secondly, wheat is blighted, when the grains are brought to the time of their maturity, but are light, and of little value for making of bread, because they are not well filled with flour.

lation or other precautions*. Man was endowed with thought, for the purpose of examination and enquiry; and if he makes a proper use of the powers which Providence has bestowed upon him, there is nothing essential for his subsistence and comfort which he may not obtain.

Impressed with these ideas, I shall proceed to state the various means for preventing, or diminishing those disorders, so fatal to this important production. It is not my intention to dwell upon such remedies, as burning straw and weeds in a serene night; sticking up branches of laurel, and other shrubs of the same sort; sprinkling the corn with tobacco, or with pepper; strewing among the corn woollen rags, steeped in a strong solution of salt of tartar, or of sea-salt, or good white-wine vinegar †, and other plans of a similar nature, which would be too troublesome and expensive, were they even to be successful. The remedies which I am inclined to recommend are as follow. 1. Cultivating those sorts of wheat, the hardest in point of quality, and the least liable to disease; 2. Sowing the wheat earlier than usual: 3. Introducing earlier varieties: 4. Giving a sufficient quantity of seed: 5. Draining lands apt to be wet: 6. Rolling and treading the soil after sowing: 7. Using saline manures: 8. Improving the course of crops: 9. Changing the seed, by fresh importations from foreign countries: 10. Extirpating diseased stalks or blades early in the season; and, 11. If the crop is decidedly affected, instantly cutting it down. By one or other of these means, and the improvements which may be effected in them, by the observations of ingenious naturalists, and the experience of intelligent farmers, I have little doubt, that the dis-

* On the same principle, no attempt should be made to prevent the smut in wheat, by pickling the seed. It is said, how can we prevent our wheat from being destroyed by the heat of the sun? To this it may be answered, that rye sown among wheat is found to be a sufficient protection; for the rye grows above the wheat, with a rough bending head, hangs over it, and protects the earth, and the plants growing thereon, from the heat of the sun.

† See the plans mentioned in Mill's Husbandry, vol. ii. p. 412.

eases of wheat might, in a great measure, be totally subdued, or their effects so counteracted, that they would not be felt as a national calamity.

1. *Sorts of Wheat.*—In a plant of which there are such a number of varieties, as is the case in wheat, it is evident, that there must be some distinguished by peculiar properties, and consequently less liable to accidents or disease. This is a point which has not yet been sufficiently investigated, but which will require the particular attention of the naturalist, and of the farmer. It may be proper, in the interim, to state, 1. The sorts already known, which are considered to be the most liable to disease; and, 2. Those which are the most likely to be exempted from it.

1. It can hardly be doubted, that the white wheats are tenderer, and more delicate, than the red; and the latter, in particular, is less liable to destruction by insects. The result of a careful examination, in the same field, of a certain number of ears, grain by grain, without selection, was, that the white wheat was destroyed at the rate of $2\frac{1}{2}$ grains to an ear, and the red at the rate of only $1\frac{1}{2}$ *. At the same time, Tull and others recommended the white cone wheat, as the best kind for sowing in fields subject to the blight, the stalks not being hollow, like that of common wheat, but full of pith, like a rush, through which the grain may draw its nourishment, independent of the outer part of the stalk. I understand, from most respectable authority, that in Worcestershire, they sow a species of cone wheat, which they had originally from Courland, and which is not liable to be spoiled by bad weather.

2. In regard to the chaff, it would appear, that the thin-chaffed are much less liable to the mildew than the thick-chaffed ears; and an intelligent farmer in East Lothian states, that those with

* Transactions of the Linnean Society, vol. iv. p. 237. Mr Hall, near Beverley in Yorkshire, observes, that the white wheat suffers much more than the red, and that in varied situations, and different fields, where the red and the white had exactly the same management. Where the soil was the same, the white universally suffered most.—App. p. 3.

a smooth chaff, do not absorb or retain much moisture, and thus escape the mildew in the ear; adding, that if the thick-chaffed wheats had been in use, the crops would have been good for nothing. Mr Trotter of West-Lothian also observes, that the thin-chaffed wheats, are less subject to mildew, blight, &c. than the woolly-eared or thin chaffed-sorts.

A variety of red wheat, known by the name of *Creeping Wheat*, has of late been raised in the counties on both sides of the Tweed. It was imported from Yorkshire, where it was cultivated with success, on a poor sandy soil. It is chiefly prized for its hardy nature, resisting well the effects of frost, in the early stages of its growth, being less liable, than any other sort, to be thrown out in spring, and yielding greater returns in poor soils. Above all, it has been found less liable to the mildew, in districts where that disease has greatly prevailed; and some farmers in Berwickshire now sow no other sort either in winter or in spring. It is reported from East-Lothian, that it produced double the quantity, compared to the ordinary sort, though the latter was dunged, whilst the other received only a dressing of lime. The straw of the creeping wheat was, in one instance, partially mildewed, but the ear was not affected. It possesses a visible property of collapsing, or creeping together in cold weather, in the spring, which perhaps may prevent insects from depositing their eggs in the ear. In regard to spring or summer wheat, its exemption from the mildew is proved by most satisfactory evidence.

2. Early Sowing.—This practice, as a preventive against the mildew, has been recommended above a century ago, in the following strong terms: “ The sowing of wheat early, hath been esteemed, and doubtless is, the best remedy against *mildews*, by which means the wheat will be filled in the ear before they fall, and your increase will be much more: As, for curiosity’s sake, wheat was sown in all the months of the year: That sown in July, produced such an increase, that is almost incredible *.”

* Worlidge’s *Systema Agriculturæ*, one vol. folio, printed anno 1681, p. 210.

In confirmation of this doctrine, it is stated, that the crops in England, at least in the county of Somerset, were formerly reaped much earlier than at present, the wheat harvest being generally over in the month of July, *and that the mildew was then unknown* *.

In the year 1785, the Earl of Orford tried the following experiment: He sowed about eight acres with wheat, as early as May, and he resolved to let it stand as a crop for the ensuing year. It was thrice fed off with sheep, before the ensuing Christmas:—the ground then seemed so bare, that four of the acres were ploughed up, on the supposition that the plants had entirely perished; but two acres were left, which, in July, 1786, yielded a crop as productive as any in the neighbourhood †.

Mr Claude Scott, whose attention to every particular connected with the agriculture of the country is so well known, in a communication to the author, observes, upon this branch of the enquiry, that early sowing is the best preservative against mildew. He thinks so, partly from his own experience, and partly from that of others. He remembers, too, that many years ago, a very judicious and experienced farmer in Essex, had his crops of wheat mildewed for many successive years. It happened that he had adopted a system of growing wheat after beans, which was not the custom of his neighbours; it was therefore always very late in the season before he could sow his wheat. It occurred to him, that the late sowing might be the cause of his crops being so subject to mildew; he therefore determined to alter his system. He sowed wheat upon his clover leys, or after a fallow, which enabled him to put it in very early. The consequence was, *that he had no more mildew*. Mr Western, so intelligent in all questions connected with agriculture, has conceived the same idea, and thinks that *early sowing* is the best preventive. One of Mr Scott's neighbours in Kent thinks the same, and always sows early. His wheat this year (except in one field that was sown late) has escaped the mildew.

* Communications to the Board of Agriculture, vol. v. p. 202.

† Annals of Agriculture, vol. viii. p. 191.

I am informed by a friend in Devonshire, that, from the year 1798 to the present time, the early-sown wheats, particularly in the South Hams, have always proved the best, and that the crops of this year, sown before the 20th of November, have turned out good, whilst those sown in spring have been mildewed.

The opinion of Tull is also in favour of early sowing *; and various communications which I have received from Roxburghshire, and from Kent, are in favour of the same practice. In America, also, it is believed that there is no other remedy but to sow early; by means of which, the plant is rendered more vigorous in the season of the mildew.

The advantages of sowing early are three. 1. By means of early sowing, the wheat may escape those great and sudden transitions of heat and cold, moisture and dryness, which are the principal agents in causing the mischief; for those transitions are most likely to happen, when the summer is pretty far advanced. 2. The mildew, also, is more likely to affect the late-sown wheats, because they are often in a green state, in the month of August, consequently more full of sap, and hence more likely to be affected by the frosts, which occasionally take place at that season of the year. 3. It is also the opinion of many intelligent farmers, that the maggot or insect does most mischief to the late-sown wheats; whilst the early-sown receive little or no injury: And this is extremely probable; for if the grain has arrived at a certain degree of hardness and consistency, (which may be the case with the early-sown, and not the late-sown wheats), before the insects make their appearance, they cannot do it any material mischief †.

It is not to be supposed, however, that early sowing is not attended with some disadvantages, which, in the opinion of some, outweigh the benefits to be derived from it. The vegetable pasture, or nourishment in the soil, it is said, is exhausted by the stalk, before the formation of the grain or pickle commences; in

* Horse-hoeing Husbandry, p. 147.

† Transactions of the Linnean Society, vol. iii. p. 247.

consequences of which, after having been accustomed in Scotland to sow wheat as early as August, they gave it up, finding that the crops, though bulky, were deceitful *. But the question is, did the wheat escape the mildew? for it is better to have a bulky, but deceitful crop, than none at all, which is unfortunately the case with many farmers both in England and Scotland this year.

It is also said, that the early-sown wheats are apt to be injured by spring frosts; and it is evident that may be the case, if they are bulky, and full of sap, *and if the crop has not been fed off by sheep*, which plan ought always to be adopted, when the wheat grows too luxuriantly, and becomes *winter proud* as it is called. I know well, that Tull condemns that practice, and contends that it makes the straw weak, and the ears light, that it retards the time of blossoming, and that it produces only a second crop, which is always weaker than the first would have been †. The question, however, still recurs, Does early sowing, accompanied with sheep-feeding, prevent the mildew? for it is infinitely better to have light ears, and a good crop of straw, than to have a crop totally useless.

3. *Introducing earlier Varieties.*—As sowing early is certainly attended with some disadvantages, it would be extremely material to procure a sort of wheat, either from some foreign country, or by selection at home, that would ripen early, without being sown much sooner than at present. For that purpose, the skilful and industrious farmer, might select the ears that ripen earliest, and should increase the quantity by degrees. Nature produces *varieties of species* of the same genius; and it is the duty of man to take advantage of such a circumstance. This plan has been often recommended to the attention of the farmer, and in this particular case, ought perhaps to be encouraged by public premiums.

* Dickson's Husbandry. Virgil in his Georgics also makes the same observation.

† Horse-hoeing Husbandry, p. 148.

4. Proper Quantity of seed.—It is contended by some, that **early sowing, and much seed,** is some security against the mildew. Others assert, that thin and poor crops are in general the least affected by mildew. According to the experience of this year, the thickest and strongest crops have suffered more than those that were thin upon the ground. On the whole, it has been observed, that a moderate thickness of the crop, upon all soils fit for wheat, is to be preferred, neither too thin nor too thick. In regard to thin sowing, it is stated, that a farmer who dungs high, grows many green crops together, and sows very thin, (only $1\frac{1}{2}$ bushel per acre), has his wheat always mildewed, though his neighbours' crops are exempted.

5. Draining.—It is reported by one of my correspondents, as the principal cause of the failure of the wheat crop, that the earth, during the last summer and autumn, was completely filled with water; by means of which, he conceives, that the roots of the wheat were so overmoistened, as to occasion a check or decay in the whole stalk; and the straw being thus injured, it was incapable of bringing the ear to maturity. It is also observed, that the mildew generally prevails in the lowest and dampest part of the field; and that lands having a clayey bottom, and a moist, or rather heavy surface, are particularly subject to this disease. Indeed, some imagine, that even sowing when the land is in a wet state, has a tendency to weaken the plant, and to produce mildew.

To prevent this source of disease, a thorough draining of the land is absolutely necessary, on the principle of what is called in Essex and Hertfordshire, *Land-ditching*. It is impossible here to describe that process, but it is fully detailed in the Agricultural Reports of those two counties, and in a valuable Treatise on the Draining of Land, published under the sanction of the Board of Agriculture, by Mr Johnstone. It is evident that it is of the utmost importance, to sow the seed when the land is in a dry state, and to have drains in every direction, by which any superfluous moisture may be taken away, whilst the crop is growing. The mischievous effects of heavy rains, may thus in a great measure be counteracted.

6. *Rolling and Treading*.—I had recently an opportunity of seeing an anonymous publication, dated 27th October 1808, recommending rolling and treading, as a preventive of the mildew. The author quotes an old proverb in support of his doctrine, “*Tread the wheat in, in muck; and barley in dust:*” and he states it as his opinion, that if all the land, *be the soil what it may*, were trodden with a troop of horse, or a drove of cattle, after being sown with wheat, there would scarcely be such a thing as the mildew known. In proof of that assertion, he states, that part of a field that was trodden like a highway, produced an excellent crop, (thirty-two bushels per acre weighing 63 lbs. a bushel), whilst the land that was left as light as possible was mildewed.

He mentions, that a farmer who keeps 300 pigs, has greatly improved his wheat crops, by treading them in by his pigs, as they do it most effectually, from their weight, and the smallness of their feet. He attributes the destruction of crops of wheat, in a great measure, to the furrows being left hollow; in consequence of which, the crop is apt to die away in the winter and spring.

As an additional proof, he adds, that, in a field of nine acres of clover-stubble, sown with wheat, the plants all died during the spring, excepting the *head-land*, which the horses had trodden much in turning, which produced as fine a crop as any in the country. He considers *treading* as infinitely superior to *rolling*; as the latter leaves the land with a level surface, against the winter, which often blisters after frosty weather, and rises up, bringing the roots of the wheat out of the ground.

It is certain that treading, by consolidating the soil, is found to be a useful practice in husbandry: it may have the effect also of destroying the *larvæ* of insects, and of preventing their harbouring in the soil. It would require, however, many additional experiments to satisfy the public, that treading alone, was so effectual a preventive against the mildew as this author imagines. If it were, machines might easily be invented that would answer the purpose effectually, or horses might be furnished with broad and heavy shoes, in form resembling those used on mossy land,

at Castle-head in Lancashire, of which a description is given in the Communications to the Board of Agriculture.

7. *Saline Manures*.—I was accidentally informed, that there was a field in Berwickshire, containing about sixteen acres of a light dry turnip soil, the exposition and elevation of which were nearly similar, and that about five acres of it were manured with sea-ware, which part retained a considerably healthier colour than the rest of the field, and that the produce was estimated to be about one-third better, quantity of produce, and the quality of the grain, both considered; though the rest of the field was partly manured with lime, and partly with dung. I was thence led, in the course of my enquiries, to pay particular attention to the effects of saline manures, as a preventive against the mildew.

It evidently appeared, in the course of my enquiries, that all along the coast of Yorkshire, Durham, Northumberland, Berwickshire, East-Lothian, and Fife, the vicinity of the sea has either hindered the mildew altogether, or prevented any material injury from it. By a communication from Sussex, however, I was informed, on the most respectable authority, that the sea-coast there is not exempted; but that this is to be attributed to their over-manuring with dung, in consequence of which, a field was completely mildewed, at the very gates of Dunbar, a seaport town on the east coast of Scotland, whilst all the neighbouring district was exempted.

If the sea air is of use, it is most probably owing to the saline particles of which it is full, and which it has deposited on the earth adjoining to the shore, in the succession of many years. Hence the grass on the sea-coast is always finer than in the interior of the country; and it is well known, it is wholesomer food for all domesticated animals.

In order to ascertain the effect of salt on vegetables, let us consider the advantages derived from the use of it to the animal creation. It certainly affords no kind of nourishment, nor will it digest, for it passes unaltered through all the strainers of the human body; but as the celebrated Haller justly observes, it is of use, by stimulating the secretions, by promoting a free perspiration, and by preserving bodies from corruption and pu-

trescency. In these respects vegetables may derive benefit from a moderate quantity of it, as well as animals. If the dews, by the clamminess of their nature, check the perspiration of plants, salt is likely to restore it; for persons who have a clammy skin, owing to their abstaining from the use of salt, have their perspiration restored, when they return to the use of that article. It is well known, that when the mildew attacks wheat, the straw becomes perfectly rotten; nothing but salt then can prevent that corruption *.

If the diseases to which plants are liable are produced by insects, there is reason to hope, that salt, used in a judicious manner, would render the juices of the plants too acrid for them.

Sea-ware, and other saline manures, might also have a tendency to strengthen the plant; and there can be no doubt that plants in full health, are better qualified to resist disease, than when they are in a weakly and debilitated state.

Such were the reasonings in favour of the advantages of saline manures, when fortunately some facts were transmitted to me by a respectable friend, Davies Giddy, Esq. member for Bodmin in Cornwall, which strongly corroborate that idea. The following is an extract from Mr Giddy's letter, dated the 24th November 1808.

"Mr Henry Sickler of Gwinear near Hoyle-Marazyon, Cornwall, has written to me to the following effect:—‘ You know when I took Treneath, it was entirely spent. The first thing I did was, to go over it with turnips. The manure was twenty five bushels of salt, of 84 lb. each, per acre †. Wheat followed; and

* Darwin considers salt as a stimulus which possesses no nourishment, but may incite the vegetable absorbent vessels into greater action: it may, in a certain quantity, increase their growth, by their taking up more nourishment in a given time, and performing their circulations and secretions with greater energy. In a greater quantity, its stimulus may be so great as to act as an immediate poison on vegetables, and destroy the motions of the vessels, by exhausting their irritability. *Phytologia*, p. 336

† Refuse-salt, disposed of for agricultural purposes, is measured by a bushel, containing 84 lbs. or 3-4th of the great ewt. Mr Sickler, however, means the Cornish acre, which exceeds the English statute acre, in the pre-

I never had a rusty straw, when the ground was so managed. One field of six acres, that was not worn out so much as the rest, I put into peas, followed by wheat: the crop rusted so badly, that I had not five bushels on an acre, and the sample was a very bad one. Next, turnips on the wheat, a rich stubble, with the usual quantity of salt, succeeded by wheat, a very heavy crop;—no appearance of rust. This field, in my course of crops, has since been three times in wheat, without the least appearance of rust; nor have I found a rusty straw in any of the fields salted for turnips, whilst on the lands of Coswinsawsen, which were not salted, some have appeared. It never occurred to me, that salt prevented the rust, until I saw your letter; but now it strikes me very forcibly, that salt prevents its appearance.—I should be very glad if I could speak more fully to the subject. This is all I know at present; but I am determined to try some new experiments for a wheat crop.'

"It must be remarked, that the salt used by Mr Sickler was previously employed in curing pilchards, and therefore probably contains some oil. Refuse-salt from the pilchard fishery is completely free from duty."

Mr Sickler informs me, that the soil he cultivates is a strong brown earth, on a free working clay, nearly like marle, good wheat land, and carries heavy crops of barley and oats. He had farmed the estate, in December 1808, above seventeen years. It was spent with tillage when he took it, and all the straw had been carried off from it for a number of years. He went over it first with turnips, winter fallow, twice ploughed in May, sown with 25 bushels of salt, of 84 lbs. each bushel per acre, about a fortnight before the turnips were sown. This was his practice, until he went over all the estate, except one field, above mentioned, which he put into wheat, without turnips or salt, and which was mildewed. Since that time, his course of crops is, first wheat, then

portion of 144 to 121, or very nearly 25 to 21, or 6 to 5. The quantity of refuse-salt, therefore, used per acre, is $31\frac{1}{2}$ bushels, of 56 lbs. weight, or 1764 lbs. of salt to each statute acre.

turnips on the wheat stubble the following summer, then barley, with seeds for three, four, or five years, before breaking up again for wheat.

The practice was first introduced by himself, but it is now become more general. The kind of salt is what has been used to cure pilchards. The price, when first used, was 6d. *per bushel*; but now it is from 9d. to 1s., since there is a greater demand for it. Some of it they lay on the fish twice, which is not so valuable as that which is used but once, as there is more of the strength of it spent on the fish. It makes from 1d. to 3d. a bushel difference on the price. There is no duty on this salt. It is bought at home, for about 2s. *per bushel* by the fish-curers; but the greater part import their salt from Liverpool, at which place it does not cost them more than from 9d. to 1s. *per bushel**. After it is done for curing fish, an officer examines and condemns it, and then the owners sell it for manure. Before it was made use of in this way, they used to throw it in the sea. The crops, under this system, are equal to any dung crop. The turnips are both drilled and broadcast. The latter is twice, and the former three times hoed. The drill has been used by one farmer for these two years past, and will soon come into more general use, as it is a great improvement on the broadcast.

The benefit of this manure is very great, and dung can be safely used afterwards, without occasioning mildew. Mr Sickler tried it for a corn crop, but does not think that it has so good an effect for that crop, as when mixed with dung, earth, and sand. The effects of it, on the clover, however, in the barley stubble, is astonishing. Some of his land he has not salted these seven years, but he can plainly see the effects of it, in the grass and corn, till this time. Some of the land that was not worth 5s. *per*

* Rock-salt at the pit costs only 3½d. *per bushel*, of 65lbs., and white salt, at the works in Cheshire, only 6d. *per bushel*, 56lbs. Duty-free fishery-salt, at Leith, is only 1s. 2d. *per bushel*, and large ground ditto, 1s., and 11½d.; so that the expence of salt as manure, if *free from duty*, is no obstacle to its use, as it would not exceed from 30s. to L3 *per acre*.

acre, when he first took it, has carried, this last harvest, (the third crop, without any manure for either of them,) forty-eight Winchester bushels of barley *per acre*; and as a proof of the improvement of this estate, it is now let for L.130 *per annum*, though Mr Sickler rented it for L.50; and, when he took it, no person would give any thing for it. The proprietor kept it in hand one year, in which time he published it, four times, to be let, and no person attended the survey. Notwithstanding the increase of rent, he believes that any man would do very well on it; and he is convinced, that the increase in value is owing chiefly to the above management. He never uses dung for wheat, but spends it all for potatoes and top-dressing.—Never had any mildew on the land that had been salted for turnips, but has had it in land that was never salted.

The salt has been found to be an effectual preventive against the mildew, whilst the neighbouring fields are subject to that disease. Indeed the mildew is very injurious to some estates in that neighbourhood, but not with turnip farmers. Mr Sickler has enquired at some of them, that have been in the habit of sowing salt for turnips, and they all agree, that they never had any mildew, where they have sown salt for that crop, but, before, they were greatly affected by it. The good effects of salt is experienced, on strong, as well as light soils. It has never been tried with potatoes, for, as sea-weed always makes the potatoes waxy, it was thought that salt would have the same effect.

Mr Sickler is of opinion, that salt is calculated for universal application; and, so far as his experience extends, he thinks that there is no greater improver of land.

What a pity, that the duty upon salt should interfere with such a source of beneficial improvement!

The advantage of salt, as a manure in general, has been long known in Cheshire. Lord Crewe informs me, on his own experience, that it is of great use in fallows, and that it was formerly much used, but that it has now gone into disuse, as it cannot now be had for less than 17s. *per bushel* of 56lbs. weight. He adds, that it would be of great importance to agriculture, if government would permit the refuse-salt, of which such immense quan-

tities are now thrown away, to be taken from the works, free from duty. It is at present of no service whatever to the manufacturer, and in fact an inconvenience.

As to the mode of applying salt, it would require many experiments fully to determine that point. A moderate quantity may be sown at the same time with the seed. If disease is apprehended, it may be again sown upon the growing crop, and its effects ascertained on every alternate ridge *. The efficacy, also, of other saline manures, ought to be fully ascertained, as sea-ware, in which there must be a great deal of salt, as is evident from the kelp it produces; also sea-mud, in which there must be many saline particles. It should likewise be ascertained, whether mildew was ever known on salt-marshes, and whether coal or other ashes prevent it †.

In a work of some authority, (Chambers's Dictionary, *voce* Mildew), it is said, that lands which have for many years been subject to mildews, have been cured of it, by sowing soot with the corn, or immediately after it. That idea, however, is far from being ascertained. Soot, when mixed with bark taken from a tan-pit, produces excellent crops of wheat and other grains; the crops also are uniformly more free from vermin, and the ground much freer from weeds, than with manure taken from a compost dunghill, (more especially if the refuse of the shambles make a part of it); and it has been found, that the recrements or refuse of soot, obtained from the manufacturers of sal ammoniac, is of great use in destroying the insects injurious to grain, and has a most surprising effect in improving grass; producing a much stronger crop, of a much deeper green, of a longer and broader leaf, and much superior to any grass with the common manure of the streets, with horse dung and farm-yard dung, all

* It may be used on fallows, where the soil is strong, as was formerly practised in Cheshire; or Mr Sickler's plan, of using it on turnips, may be adopted.

† Darwin, in his *Phytologia*, p. 321, recommends the drier sorts of manure, as coal-ashes, and bone-ashes, as a remedy against the mildew, which is so often occasioned by damp.

mixed together. In a compost dunghill made with those articles, a number of fungi are constantly appearing; whereas there was not the least symptom of them in a depot of soot, kept distinct from other sorts of manure *.

If it could be ascertained that salt, and saline manures, in general, are an effectual preventive against the mildew, it certainly would be one of the most important discoveries hitherto made in agriculture. If the point is once established, it is probable that a much smaller quantity than twenty-five or thirty bushels *per acre* may be found sufficient, and that the duty will be remitted on the salt, to promote so important an object as the safety of our crops, and the security of our subsistence. The expence of salt would then be no obstacle; the price of rock-salt being at this time, at the pits, only 3½d. *per bushel*, of 65 lbs., and the white salt, at Liverpool, only 6d.

8. Rotation of Crops.—There is every reason to believe, that the mildew might be greatly prevented, by adopting a proper rotation of crops. Over-manuring with dung, immediately applied to the wheat crop, is apt to occasion mildew, and it is found an almost effectual remedy, if the dung is applied to a smothering crop, as cole-seed on strong lands, or potatoes on light soils. In regard to the former, we are told, on respectable authority, that the mildew is never, or scarcely ever known, after a crop of cole-seed †. As to potatoes, an intelligent farmer in West-Lothian had a field sown with wheat, partly after summer-fallow, partly after clover ley, and partly after potatoes; the two former were mildewed, whereas the part where the potatoes had been sown,

* The experiment, as to the grass, was tried in the parish of Corstorphine, on a clay and wet soil, ridge by ridge alternately, with common compost dung on the one ridge, while the other was sparingly manured with the refuse of the soot. If soot is taken from a chimney, (of course it is more caustic), it must have a *bad* effect, by its superior burning quality, much in the same way as quicklime would have on a thin soil. At the sal ammoniac works, the refuse of soot is only 6d. to 7d. per cart of two horse draught.

† Annals of Agriculture, vol. i. p. 332.

was the same on all sides, the grain more equal and plump, and indeed only about one-tenth of the usual quantity deficient. Mr Trotter adds this most important observation, That he has always found wheat after potatoes a more certain crop, and less subject to common accidents or diseases of the season, than after any other crop *.

Potatoes on light, and cole-seed on strong soils, may prevent the mildew in two ways. In the first place, if too much dung occasions the propagation of fungi, which there is every reason to believe is the case, by exhausting and diminishing the strength of the dung, it may take away that tendency. And, in the second place, both potatoes and cole-seed are smothering crops, which, by ameliorating the soil, or destroying the larvae of insects, may prevent the diseases of wheat. In regard to potatoes also, it is a great advantage, that, when they are taken up, the ground is very much trod upon; and treading, as has been already observed, is an enemy to the mildew.

Nothing can be of more importance, than to extend the culture of potatoes, more especially if that crop is found a remedy against the mildew. It is admitted, that on strong clays, which are the proper wheat lands of the country, the mildew is not so injurious. If, therefore, by sowing wheat after potatoes, that grain could be raised with safety, on light soils, what an object would be gained! It is well known, that in Mid-Lothian, wheat is seldom mildewed; because, on the light soils, it is commonly raised after potatoes; and for the same reason, the crofts, or patches of wheat, raised by small farmers, are seldom diseased. Too much manure, it has been already observed, occasions mildew, and potatoes may leave the ground in a proper state, so as to be fit to raise wheat, without being too rich.

It is the more necessary to attend to this subject, as it would appear, that wheat after clover-ley, (the usual system on light soils), is very apt to be mildewed. This is particularly the case, where the crop of clover is abundant. Out of forty-five acres of

* In Roxburghshire, however, wheat after potatoes was mildewed.

wheat forty were sown on clover-ley, of which thirty-nine were mildewed, and only one acre, which had been sown with real spring-wheat, escaped the mildew; but the quantity was small, and the sample very bad. The remaining five acres were sown, partly after potatoes in the autumn, and partly after turnips in the spring. They produced twenty bushels per acre. Mr Trotter of West-Lothian, sowed a small field in January 1807, with wheat from Kent, upon clover-ley, with no manure, and found it considerably mildewed, whilst no other part of his crop was in the least affected. If this idea is well founded, it would be of infinite consequence, to have the crop of clover, *after the wheat*, and not before it. The rotation, then, should be, 1. Potatoes, or, (if they would answer equally well as a preventive against the mildew), turnips; 2. Wheat; 3. Clover; and, 4. Oats, or Barley.

9. *Change of Seed.*—As wheat is not indigenous, but an exotic plant, it might be less liable to disease, if the seed were occasionally changed by importations from foreign countries. Not being a natural production of Great Britain, it may degenerate, when constantly sown in the same soil, and in a less favourable climate. The plants of a southern, being, during the course of many successive years, exposed to all the inclemency of a northern climate, may thence acquire a tendency to various disorders, from which naturally they were exempted. Their stamina might gradually be weakened, which might be the source of disease.

A change of seed from one farm to another, has often proved advantageous; but an importation from a soil and climate totally different, might possibly prove still more beneficial. It is to be hoped, therefore, that every means which the present state of our foreign relations can admit of, will be adopted, to procure a supply of foreign seed, and to ascertain the efficacy of so important an experiment.

On this subject, the following observations are made in Miller's Gardener's Dictionary, (*voce triticum*). “The most skilful farmers purchase seed, at least every other year, by way of change; for they find, that the seeds continued long upon the

same land, will not succeed so well, as when they procure a change of seed from a distant country; and the same is practised by the husbandmen of the Low Countries, who commonly procure fresh seeds from Sicily, every second or third year, *which they find succeed better with them, than the seeds of their own country,*" &c.

As a proof of the advantages of foreign seed, it may be observed, that Mr Riddell of Timpendale in Roxburghshire, had two small parcels of wheat from Sicily, one of them a red sort, the other a beautiful transparent white wheat; both kinds were bearded; they were sown on the 2d of May, and were ripe on the 25th of August. A small part of the straw of both kinds was affected, *but the greater part was perfectly clean.*

A singular idea has occurred regarding the diseases of wheat, which it may be proper here to state. It is well known, that the curl in potatoes has been effectually prevented by using potatoes as seed that have not arrived at maturity. And it is said that corn, like every other vegetable, or animal, which has been brought to the highest pitch of perfection by artificial culture, and too great a quantity of food, is peculiarly liable to degenerate, and to propagate a feeble and diseased progeny. It is therefore contended, that the general high state to which the culture is brought, and the largest and plumpest grain being generally selected for seed, are the causes why wheat is more liable to disease than formerly; and that the diseases to which wheat is liable, might be prevented, if the farmers, in the more fertile vales, were to bring their seed-corn from the neighbouring hilly and less luxuriant soils. This idea may be worth the trying.

10. *Cutting diseased Blades.*—It is observed by the straw manufacturers, that every year, some stalks are mildewed or rusted. The disease, therefore, always exists, but is more prevalent in some seasons than in others, according to the weather.

As the mildew, it would appear, prevails to a certain extent every year, it is suggested, on the most respectable authority, (Sir Joseph Banks), that it might possibly be prevented, or at least rendered less extensively injurious, if farmers were, by way

of precaution, to search diligently in the spring, for young plants of wheat, infected with the disease, and carefully to extirpate them, as well as all diseased grasses, for several of them are subject to this, or a similar malady. Diseased plants and grasses have the appearance of orange colour, or of black stripes in their straw, or on their leaves.

The existence of brown rusty spots was observed by an intelligent correspondent, (Mr Hall, near Beverly in Yorkshire), who states, that he first remarked them upon the uppermost broad leaves, and that they were perceptible even before the wheat got into the ear. He believes, that such spots prevail, more or less, every season, but this year they were very abundant.

It appears that Mr Chateauvieux cut off the mildewed blades, and found the trial to answer; for the same plants produced new blades, and throve much better than those on which this operation had not been performed. But this cannot be done, except when the corn is young.

11. *Early Cutting.*—It is strongly recommended, on various authorities, as soon as a field of wheat is evidently affected, to cut it instantly down, even though it should not be in a ripe state.

We are told, that it is a practice near Warminster, as soon as a field is *blasted*, as the farmers call it, (which sometimes happens in a day and night), to cut it down long before it is ripe. It is their opinion, that vegetation is stopped, and the only way to preserve the crop, *from being entirely lost*, is to reap it immediately.

Mr Hall, near Beverly in Yorkshire, considers early cutting, when the crop is evidently affected by the mildew, as a considerable preservation for the straw, which is thus rendered fitter food for cattle. An experiment was tried with a mildewed crop, part of which was cut down immediately, and laid on the stubble to ripen, and the rest was allowed to stand, to be dead ripe before it was cut. The corn was no better than the early cut; but the straw was so preserved, that in a situation near London, it would

have been worth from £.10 to £.11 per acre, as litter for horses, whereas the straw of the wheat that was suffered to stand was good for nothing.

An intelligent farmer in Gloucestershire, recommended as a general rule, to cut mildewed wheat as soon as it was struck with the disease, which he said kills the mildew. The disease being stopt, the nourishment in the straw passes to the ear, in a pure untainted state, and the crop will be tolerable, though it is cut down almost in a green state, and three weeks before the usual time *.

The doctrine, however, of early cutting, may be carried too far. The first attack of the mildew is sometimes slight, but if a second attack takes place, no time should be lost in separating the crop from the ground. From the experiments of an intelligent farmer, it appears, that it is the best plan to pull it up by the roots, but that would be too troublesome and expensive, except for small patches. He found it by far the best plan, to lay the sheaves on the ground, *covering the ears*, which prevented them from drying too fast for the first six days, and then to stack up in the usual way, to be made sufficiently dry for carrying in †.

In regard to the straw, early cutting has certainly the effect of preventing that part of the vegetable from being disposed to putrefaction, or decomposition; and though it is known, that the vegetable juices lodged in the straw, will in some degree pass into, and feed the grain, after it is separated from the ground, yet it is doubted by some intelligent farmers, whether the practice is of use to the grain, and still more, whether it can afterwards be safely used as seed.

Duhamel asserts, that the small grains at the point of the ears, even though not impregnated, are not incapable of growing; and that parched and shrivelled grain, if the distemper does not prevail to a very great degree, sprout very well, and are good for

* Marshall's Gloucestershire, vol. ii. p. 54.

† Communications to the Board of Agriculture, vol. v. p. 206, where this plan is more fully detailed.

seed. Sir Joseph Banks is of the same opinion, and his sentiments are supported, by the communications of others, inserted in the Appendix to this paper, as originally printed. It is stated, in particular, that though the mildewed wheat of 1804 was sown, yet there was no complaint that it did not vegetate, or that it produced only puny plants: but the wheat was much too thick, for the farmers sowed the same measure, without considering that the seed was so much smaller than usual, and consequently, that a much greater number of grains were sown. One of the most curious facts, regarding the sowing of diseased grain, occurred in the south of Scotland. In the course of the year 1807, a gentleman was induced to cut down his peas, which had been attacked by vermin, before the pods were one-third filled, in order to take the chance of saving his straw; but the crop having produced some peas also, which looked healthy, he was led to sow them, and from that seed, had this year a most plentiful crop, both of straw and peas well filled, and of an excellent quality. At the same time, it would be highly proper, to try any suspicious grain in pots, previous to its being sown in any great quantities; and if good seed could be obtained without difficulty, and at a moderate expence, it certainly ought to be preferred.

Such are the various modes, which, so far as my reading or information goes, have hitherto been suggested, for preventing or diminishing the destructive consequences of this dreadful calamity, which, it appears from Scripture, was the terror of the Jewish husbandmen *, and for which no effectual remedy has hitherto been suggested, though I think a foundation is now laid, by which it may in future be at least materially checked. It was indeed the most humiliating scene I ever witnessed, to see, last autumn, the exertions of some of the most skilful and industrious farmers that Europe can boast of, when they had every prospect of a most abundant return for all their labours, at once unfortunately blasted, and totally lost.

* “ If there be in the land, famine, or if there be pestilence, blighting, mildew,” &c. 1 Kings, chap. viii. ver. 27. See also 2 Chron. chap. vi. ver. 28.

I have the satisfaction of adding, that the diseases of wheat have fortunately attracted the particular attention of the President of the Royal Society, whose great experience, and the acuteness of whose observation, will, I have no doubt, throw new light on this most important subject, and whose zeal, for the public good, will, I trust, induce him, to communicate the result of his observations to his country, with as little delay as possible*.

No. XXXVI.

ON THE IMPROVEMENT OF WASTE LAND, BY COVERING THE SURFACE WITH SAND OR GRAVEL.

MR CHEAPE of Rossie in Fife, has improved a considerable tract of wet mossy land by covering it with sand and gravel. Such land, when the stuff is to be had near, is susceptible of being improved from 4s. to L.4 of yearly rent, that is to say, the covering process alone will not accomplish such a complete change, but it renders such land capable of being improved by the ordinary dressings of lime and dung, so as to carry crops to perfection. Mr Cheape has generally put on the sand or gravel from 2 to 3 inches thick, but never found it overdone. He has always taken the nearest, whether sand or gravel; but if he were to make a choice, he would prefer sand to clean gravel, especially if it is coarse. If the gravel, however, is small and earthy, or contains any mixture of clay, it is to be preferred. This is certainly a very expensive mode of improvement, unless the stuff

* Another mode of preventing the mildew, has been suggested, that of having a protecting ridge of barley, or, still better, of hemp, which arrests the progress of the mischief, not being liable to the disease.

to be laid on is very near. Indeed, if it must be brought beyond four or five hundred yards, it cannot be made use of with the idea of profit, nor would it probably answer in an unfavourable climate, as the expence attending it might be the same, whilst the return might be inferior in amount, and consequently inadequate.

Additional Hints regarding the Cultivation of Mossy Lands.

BY SIR JOHN SINCLAIR.

Dr James Anderson, in a work intitled, “*A practical Treatise on Peat Moss,*” printed in 8vo, anno 1799, is the first author with whose writings I am acquainted, who made the distinction between *quick* and *dead* moss. Whilst it is quick or growing, it cannot afford food for other vegetables, being a vegetable, or a combination of vegetables itself. It is necessary, therefore, to convert it into *dead* moss, before it can be productive.

The fen plough, used in Cambridgeshire, &c. is the best instrument ever invented for paring the surface, but it is not calculated for raising the *quick* moss, under the surface, and converting it into soil. That can only be effected by deep ploughing, and exposing the moss to the influence of frost, by which it is converted, not only into a fertile soil, but even into a manure, well adapted for light or for clayey lands. It is, however, particularly to be observed, that exposing a mossy soil to the influence of the sun, or ploughing it during the summer season, does mischief, drying up its moisture, and changing it into peat for fuel, after which it is almost proof against the effects of frost; whereas, the more it can be exposed to frost, the better, as it is thus changed from *quick* into *dead* moss, and fertilized at the same time. Hence, it appears, that the mosses, which are so gloomy and so unpleasant to look at, in their original state, and that abundance of frost, which so many object to in the climate of Scotland, may become sources of fertility and riches.

I shall now briefly detail, what appears to me the best system,
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for converting mossy land into a productive state, and by means of which, considerable profit may accrue to those who will engage in so useful an undertaking.

Preparation.—Begin with draining the land, so as to put it in a state fit for being ploughed, without rendering it at the same time too dry. Burn the heather; then make use of the fen-ploughs for paring the surface. What is pared off, may either be made into turf-walls, for sheltering the ground, or employed to fill up the hollows, or burnt, though the ashes of the surface are in general so light, as to be of very little service as a manure. When the surface is cleared, then take a common *Scots* plough, and during the months of September and October, and all the winter months, whilst it is practicable, plough the moss from six to nine inches deep, exposing it as much as possible to the frost. The frequent use of the roller, (and the heavier the better), is of the greatest importance in the cultivation of moss, rendering it much sooner capable of producing abundant crops of grain or grass, than otherwise could be expected, and effectually banishing that noxious weed *sorrel*, with which it is otherwise apt to be overspread.

Manure.—In the following spring, the land thus prepared will be fertilized by the frost, and easily converted, by harrowing, into mould, or what Dr Anderson calls *moss-earth*. If any clods are to be found in a rough state, they ought to be burnt; and, if the season is dry, some of the surface may be burnt, the ashes immediately harrowed in, and the ground sown. Dung, lime, clay, sand, or small gravel, may also be employed as manures, if circumstances will admit of it.

Crops.—Bear seems to thrive on lands thus prepared. Oats also would answer well. Rye would probably succeed. Rape would certainly be productive. Red-clover has not yet answered, but will most probably succeed, when the lands have been longer under cultivation. Rye-grass, and the grass called *Yorkshire fog*, seem to answer particularly well.

Succession of Crops.—It has not yet been ascertained by experience, what is the best succession of crops, in such lands, but the great object certainly is, to get them laid down into grass as

quickly as possible. They can then be broken up with the fen-plough, the surface burnt, and the quantity of rich ashes, which the roots of the grass will produce, will ensure a succession of abundant crops, for at least three years, of which two may be of grain, and with the last crop of grain, the land may be again laid down to grass.

There is every reason to believe, that by following such a system, the extensive bogs in England, Scotland, and Ireland, may be rendered fertile, and a great addition made, to the wealth of the country, and the subsistence of its inhabitants.

No. XXXVII.

ACCOUNT OF THE GRUBBER, AND ITS USES IN AGRICULTURE.

BY CHARLES DUDGEON, ESQ. PRORA, EAST-LOTHIAN.

THE Grubber is a farming implement, of late much improved, and coming into general use in East-Lothian. It was originally an English implement, known by the name of "*a Cultivator*," and under that denomination purchased from the Earl of Lauderdale at Dunbar, simplified by the purchaser, and completely adapted to the most valuable purposes of agriculture.

It is successfully used for turning up any couch, or other noxious weeds, whose roots may be turned down by ploughing. When a field has just been ploughed, harrowed, and gathered, the farmer finds a great proportion of the couch, &c. turned down, out of the reach of any common harrow, and if practicable, would plough it again, to hasten the process of fallowing. But that he cannot do without neglecting his other fields. In this case, therefore, he has recourse to the grubber, which effectually accomplishes his wishes in raising every thing to the surface. When

this object is obtained, harrowing and gathering are again successfully employed; and thus a constant succession of important labour is accomplished, in a much shorter period than ever was done before. In light land, if the ridges are once properly formed to the mould required, the grubber is capable of cleaning the land effectually, with no other ploughings than what are necessary for covering the manure which may be ultimately applied. But in the case of strong soil, it is necessary to have it more pulverized, by a few ploughings, before this implement can produce its proper effect. When it is required to level ridges by cross ploughing, nothing can exceed the grubber for that purpose. In all cases, it requires four horses; but, except when much rough sod is on the field, or an uncommon quantity of couch-grass, only a steady and attentive driver is required, and never more besides the driver, but a boy, with a plough-staff in his hand, to push away any thing that is likely to occasion any interruption to the execution of the work.

Description.

The grubber is composed of one complete frame of hard wood, (elm is reckoned the best). The sizes are various. But the following are the dimensions of one esteemed the most complete which has yet been constructed, made by Messrs Brown and Carrick, farm-implement makers, in Athelstonfoord, East-Lothian.

	Feet. In.
The length of the frame, out-side measure, is	6 9
Breadth - - - - -	3 6
Horizontal breadth of the wood, (frame and bars)	3
Vertical ditto, or depth ditto, - - - - -	3
Long hind swingle-tree, K K - - - - -	5 10
Short hind ditto, each, N N - - - - -	3 6
Soam, L, about - - - - -	11 from G
Coulters, length - - - - -	2 2
Breadth - - - - -	$1\frac{1}{4}$
Thickness - - - - -	$\frac{7}{8}$

Within this frame is a moveable one, consisting of two sides, into which are mortised, nine cross bars, about eight inches distant from centre to centre. Into these bars, the coulters are fixed with iron plates above and below, for strengthening the wood; with top and heel wedges hanging by pieces of jack-chain for preservation. These wedges must be strongly fixed when the machine is at work. It has four cast-metal wheels of 20 inches diameter, and is thereby preserved more steady as to the required depth. The wheels are also of great use in carrying the machine from field to field; and here it must be remarked, that it is necessary to drag the fore ones, when travelling on a hard smooth road, especially if on an inclined plane, as otherwise it is apt to run too fast upon, and *at least* alarm the horses. When necessary to carry it to a different field, the screws, A A, must be turned, so as to allow the inner frame to rise. That is then lifted up by the handles, B B, and supported by small iron stays, which are hung on staples, C C, and stretch to others at D D. When at work, these stays lie across the frame, and are fixed in other staples at E E. Two rods, headed at both ends, run from near D D to near E E, to strengthen the inner frame, on which a great strain lies. At F F, in the outer frame, bolts are driven upwards with screwed points, and fastened with pieces of square iron with corresponding screws. The under end of these bolts have eyes or round holes for holding the end of the chains, H H, fastened to the large swingle-tree, K K, at the other end; the soam L is fixed below the inner frame at G, passing through a strong staple under the outer frame, at M. N N are the small swingle-trees to which the two hindmost horses are yoked, and N O, N O, are the lines of their draught. The soam plays quite free under the large swingle-tree. The coulters project a little forward, as on the figure, and have steeled feet, somewhat resembling goose feet, pointing a little downwards and not horizontally. The beam, P O, of the inner frame, in order to make it shut close at C C, and rise by the handles, must have the under corner next these handles cut off, so as to leave an opening between the outer and inner beams. A three-inch twice-laid cable, (right-hand laid), is sufficient for a soam. The price under 4s.

The improvements made in the construction of this implement, were suggested by Mr Dudgeon of Broom House, in East-Lothian. The expence generally runs at from £8, to 8 guineas. When made uncommonly strong, the price is about eleven guineas.

No. XXXVIII.

POLITICAL MAXIMS, REGARDING THE IMPORTANCE OF AGRICULTURE, AND THE MEANS OF PROMOTING ITS IMPROVEMENT.

BY SIR JOHN SINCLAIR.

1. No nation will prosper long, unless it can be provided with food,—*in sufficient abundance*, exporting any unnecessary surplus;—*at reasonable rates*, but so as fully to repay the expences of cultivation:—and, where the extent of its territory will admit of it, *by domestic industry*.

2. Where provisions are scarce and dear, and the taxes, whether direct or indirect, are high, the pressure must be doubly felt by the great body of the people; nor can they afford to pay, without severe retrenchments, what otherwise they might furnish, without difficulty, to the public treasury. If cheapness, however, is the result of the importation of foreign corn, and not of domestic industry, the treasures of the country are exhausted in the promotion of foreign agriculture, and the cultivation of the soil at home, the proper basis of national prosperity, is fatally and inevitably discouraged.

3. The more the population of a country increases, it is the more necessary for its government to consider, what means are

the most likely to be effectual: 1. To augment the produce of the land already in cultivation, by the establishment of improved systems of husbandry; and, 2. To encourage the cultivation and improvement of any barren soil.

4. Neither the old cultivated land, however, can be rendered more productive than formerly, nor can new soil be brought into cultivation, unless the legislature removes every obstacle to improvement, and encourages, by every means in its power, agricultural industry; nor unless the farmers are possessed of skill, capital, and spirit, to carry on their operations.

5. In no department is Bacon's celebrated maxim more true, (*Knowledge is Power*), than in regard to agriculture: Hence no farmer can be accounted skilful in his profession, who does not avail himself of the information to be derived from the experience of others, and who does not improve his knowledge of husbandry, by the perusal of the ablest works which have been published on that subject. It is absurd to imagine, that the communication of knowledge by printing, which has promoted the advancement of every other art, should be of no use in agriculture.

6. Capital will soon be acquired, by farmers possessed of prudence, skill, and industry, where credit is attainable, where a circulating medium abounds, and where the occupier of the soil is protected, except in times of scarcity, from the destructive intrusion of foreign competitors.

7. But skill and capital are acquired in vain, unless a farmer likewise possesses energy to carry on his agricultural operations. That, however, must depend on the countenance given by the legislature to the cultivation of the soil; on the establishment of public institutions, to promote a diffusion of knowledge, and a spirit of agricultural improvement; and, above all, on the encouragement given by the landlord to his tenants, *by means of leases*, without which the agricultural can never be accounted a liberal profession, and will never be followed by persons possessed of an independent spirit, of capital, or of ability. Certainty in his tenure, can alone furnish a sufficient stimulus to the farmer, to make the necessary exertions for the improvement of his land.

8. Where agriculture is considered, by the government of a country, as the proper basis of public prosperity, and as such is duly encouraged, a nation, possessed of an adequate extent of territory, must become great and independent; but where, to prosperous agriculture, extended commerce and numerous manufactures are conjoined, an empire is raised to the highest pitch of power and opulence; and when wisely governed, it is more likely than any other, both to acquire political strength, and to establish on sure foundations, “THE PERMANENT HAPPINESS OF A GREAT COMMUNITY.”

Postscript.

The principal source of all the financial difficulties of this country, is, the enormous importation of foreign corn, and the immense sums we have paid for obtaining that supply. The total amount, for the last twenty years, will appear from the following authentic document.

An Account of the real Value of Corn, Grain, Meal, and Flour, imported into Great Britain, from Foreign Parts, in each Year, from 1792 to 1811, both inclusive.

Years.	Real Value of Foreign Corn, &c. imported. L.
1792	856,095
1793	2,021,993
1794	1,768,811
1795	1,461,622
1796	4,487,116
1797	1,455,722
1798	1,569,757
1799	1,765,840
1800	8,755,995
1801	10,149,098
1802	2,155,794

Years.	Real Value of Foreign Corn, &c. imported.
1803	1,164,592
1804	1,855,333
1805	3,754,831
1806	1,106,540
1807	1,878,521
1808	336,460
1809	2,705,496
1810	7,077,865
1811	1,092,804

Total 20 years, L.57,420,285

Above one-half of this amount was probably paid for in specie, a large proportion of which, it is said, found its way to France, and enabled it to carry on the war, which otherwise it might have been under the necessity of abandoning. These are circumstances the more to be lamented, because there never could have been any occasion to have sent any considerable part of that immense treasure to foreign, and to hostile nations, had adequate encouragement been given to agricultural exertion, within our own territory. Indeed, had a *General Bill of Inclosure* passed, when it was originally proposed, it would have saved, by far the largest proportion of the fifty-seven millions we have paid, during the last twenty years, for foreign grain; and unless it is now passed, it will be difficult to carry on the war much longer, from the continuation of the high price of provisions, and the discontent which that circumstance must necessarily occasion. Were such a law enacted, our manufacturers might be advantageously employed in cultivating our wastes, instead of being idle, when any branch of foreign trade happens to decline; and our armies in the Peninsula might be fed from our own harvests, and not from those of America,—a supply which renders us, in a manner, dependent on that country, and on which we cannot in future place any reliance.

September, 1812.

No. XXXIX.

**ON THE PROPORTION OF PRODUCE TO BE EXACTED AS RENT,
AND THE MODE OF PAYMENT.**

THIS is certainly a difficult question, and requires the investigation of a great many actually existing and probable circumstances. Upon this point, Mr Brown of Markle's paper, inserted in Dissertation No. 1. on the Size of Farms, throws much light; for the first object is, to distinguish between the home consumption and the disposable produce; the former nearly always the same, the latter perpetually fluctuating. When this is duly considered, it would appear, that upon a nineteen years' lease, the rent should be altogether in money, and not partly depending upon the value of a *portion* of that disposable produce, which is for ever varying in its *amount*. It is a definite quantity, annually extracted from an indefinite one. Mr Brown's whole farm contains 670 acres.

The home consumpt	requires	-	329
Disposable produce		- - -	341
			Total, 670

So that nearly half the gross produce, or the produce of half the farm, does not go to market in ordinary years; though, no doubt, the disposable half will generally be of greater value.

Now the question is, not how to divide the whole produce, but little more than one half of it, even upon fertile soils, between the landlord and tenant.

If we shall suppose, in a bad season, the whole produce diminished one-fourth, then, instead of 329, the home consumpt will be $4\frac{1}{4}$ acres, and the disposable $258\frac{3}{4}$ acres only; from the latter also deduct one-fourth for the deficiency of the season, and there will remain only 194 acres of an average crop. Now, if the

landlord's share is taken at the half of the average disposable produce, or the produce of $170\frac{1}{2}$ acres, this would leave only $23\frac{1}{2}$ to the tenant for profit, insurance against all risks, and for all money payments; so that his share would not be equal to that of the average years, unless prices were nearly eight times higher.

It is plain, that in years of unusual fertility, the case would be reversed, and that though prices should be considerably reduced, the tenant would still have an undue advantage. The landlord's share of the produce cannot, therefore, bear a fixed proportion, either to the gross or disposable produce of any one year. The proportion that can be paid as rent, is evidently varied by the seasons, as well as by the natural fertility of the soil, for which different proportions have been already assigned.

But there does not seem to be so great a difficulty in first calculating the average disposable produce for a term of years, and then taking the rent, at a certain proportion of that produce, to be converted into money, according to the average prices for the same period. Both the amount of produce, and the prices of that produce, however, are liable to be much higher or lower, than for the same number of years bygone, with a view to which, and not to the subsequent years of the new lease, can the proportion be adjusted. Besides, though the quantity of disposable produce may regulate the price over the country at large, it by no means follows, that it will do so in every district, nor even that the price of any particular kind of produce should be always in a certain proportion to its abundance or scarcity, and can continue to bear the same relative value, to other kinds that it did in former years.

If the rent is to be the price of a certain portion of produce, on an average of 10 or 20 years, then, *every kind of produce* should be estimated, and not one or two kinds of grain only;—and further, to make the criterion equitable for both parties, it must be taken for granted, that the same crops continue to be cultivated, and the same kind of live-stock fed. Now, there are no records like the fairs, for ascertaining the prices of butcher-meat and other articles; and no stipulation would ever be admit-

ted, which should prevent a tenant from laying his lands to grass, or from cultivating new crops, or the former crops, in different proportions, or from rearing and selling horses instead of cattle and sheep.

This method of fixing the rent according to the price of corn may be advisable, owing to the difference in the value of money at two distant periods, in case of a very long lease; but such leases are so objectionable on other accounts, that no landlord ought to agree to them. Even this plan would not give him much security on a lease for 50 years, if improvements should extend, as they have done, during the same period bygone.

For a lease of 19 or 21 years, a money rent, without any reference to prices, is to be preferred; because,

1. The different sorts of grain vary in their relative price, even for a course of years. Wheat has, of late, in some situations, been almost entirely destroyed by mildew, when other crops were not deficient, nor even wheat itself in other districts. In 1808 and 1809, a great many fields of wheat were never threshed, some of them did not even pay the expence of reaping. These failures have raised the price of wheat above its relative price for the last ten years, and particularly for the last four, as may be seen from the Report of the Corn Committee of the House of Commons; whilst the stoppage of the distilleries, and the taxes on malt, have sunk Scotch barley as much below its usual level, for a much longer period; in some years even below the price of oats.

2. Corn is not the only produce, even of arable land; one-half, or more, usually produces green crops; and the rent of much good arable land, may depend almost as much upon the price of beef, mutton, and wool, as on that of grain.

3. The kinds of grain from the prices of which the rent is to be ascertained, may not be cultivated at all throughout the lease. Poor lands, paying for so many bolls of oats and barley, may be so enriched, as to produce a great proportion of wheat. New varieties of all these grains may be introduced. Potatoe oats have succeeded to common oats, upon all tolerable good soils, and in many situations even to barley.

In truth, the amount of the rent of an improvable farm, does not depend so much on the price of grain as has been often imagined. The landlord and tenant must no doubt look back to the past, and calculate accordingly upon future prices; but it is from a greater disposable produce, as much as an advance of price, that both the one and the other expect the new rent to be paid. This part of the produce is augmented by a diminution of the home-consumption, effected by machinery, improved implements, and a more correct arrangement of labour; and, at the same time, by a better cultivation of the land already in tillage, and by the improvement of wastes and inferior soils. It is by these means, that while the price of wheat has advanced about *70 per cent.* during the last 20 years, above the average price of the preceding 20, the rent of land has risen at least *300 per cent.* throughout all the improved districts of Scotland. More grain, and that of a better quality, is produced on the same extent of land, and a greater proportion of it goes to market.

No. XL.

ON FARMING ACCOUNTS.

THE keeping of regular accounts will be found as advantageous in farming as in other business. It is with much pleasure, therefore, that I lay before the reader a system calculated for that purpose, adopted by a gentleman who resides near Edinburgh, who has paid particular attention to that subject. If it should be found too complicated for the generality of farmers, it ought, at any rate, to be followed by those of a superior description, and more especially by gentlemen farmers, who, in general, are not aware of the real state of their farm accounts, and the profit

and loss attending the business they have undertaken. Indeed, every gentleman farmer ought to insist on his steward, or bailiff, keeping their accounts according to the forms herein described.

For completely recording all farming transactions, and being enabled, at any time, to ascertain the expenditure and profit of each field, or to draw up a statement of the accounts of the whole farm, either for one year, or for any shorter period, it appears that four books are necessary. 1. A Journal; 2. A Day-labour Book; 3. A yearly servant, and Horse-labour Book; and, 4. A Ledger.

1.—THE JOURNAL BOOK.

This details the transactions of each day, with references to the folio in the ledger, where each article is posted, and the particular head under which it is placed. There are 3 cash columns in the journal; No. 1. for transactions, *unconnected* with cash payments or receipts, but which must be carried into the ledger, and posted into their respective accounts, by cross entries; No. 2. for cash received; and, No. 3. for cash expended, both entered in the ledger.

In the journal, frequent reference is made, to what may be called, "*applicable stock*," which includes in it every thing belonging to the farm. A list of the applicable stock is taken at the commencement of the year, or any other period fixed on, as Whitsunday or Martinmas, and balanced at its conclusion. In this book, there is a page for every day in the year, Sundays excepted.

The following specimen will give an idea of the form in which the transactions are recorded in the journal book.

Specimen of the Journal Book Columns.

1st Day of June, 1813.			1. For cross ries.			2. Cash re- ceived.			3. Cash ex- pended.		
Fol. of Ledger.	Account in Ledger.	Brought over	L.	s.	d.	L.	s.	d.	L.	s.	d.
	Willow- field.	2 Men turning compost.....		4						5	
		<i>Miscellaneous daily transactions.</i>									
45	Applica- ble stock.	Cr. By H. Stables, for 1 boll oats	1	11							
50	Cash	Dr. To John Paterson.....				50					
132	—	Cr. For public burdens paid....							65		
		Carried over		92	7	7	80	2	5		

2.—DAY-LABOUR BOOK.

This gives an account of the employment of the day-labourers, for every day in the week, the expence of each, together with the accounts in the ledger to which each expence is charged.

N. N. B. The columns are necessarily larger, in the books to be kept, so as easily to contain the names of the labourers, &c. &c.

3.—YEARLY SERVANTS, AND HORSE.LABOUR BOOK.

This account gives a similar view of the employment of the yearly servants, and horses ; the work done by each, and the accounts to which the expence of their labour is respectively charged. In regard to the farm-servants, a calculation is made of the annual amount of their wages, and perquisites ; which is reduced to a daily payment for the working days, and charged accordingly, as they are employed each day. The expeniture of each horse, is calculated in the same manner, reduced to a general average account, and charged accordingly. The columns in the books prepared for use, are of course larger.

4.—THE LEDGER.

This book gives the result of the whole, arranged under all the separate heads under which the expences of the farm are divided. The form of this book will easily be understood from the following sketch

		<i>Dr.</i>			<i>House Stables.</i>			<i>Contra.</i>			<i>Cr.</i>			
1813.	Feb. 12	Transactions.	Col. of Refe.	L. s. d.	1813.	Feb. 12	Transactions.	Col. of Refe.	L. s. d.	1813.	Feb. 12	Transactions.	Col. of Refe.	L. s. d.

In order to facilitate the adoption of this plan, by those who may approve of the system, books, properly prepared, may be had at Wimbolt's, Stationer, St Paul's Church-Yard, London, and at Thomson and Co's Stationers, Hunter's-Square, Edinburgh

If so many books are objected to, perhaps one Day-labour Book, for yearly servants, day labourers, and working cattle, might be contrived, and the Ledger, on a proper system, might perhaps render it less necessary to have a Journal-Book, though the extensive plan is to be preferred.

As many farmers will not go to the trouble and expence of these several books, Messrs Thomson and Co. have formed the plan of farming-books on a more moderate scale, which may answer the purposes of small farmers; the nature of which will be understood from the following specimen.

JOURNAL from

State of Weather.

Weekly State of Cash.

			Dr.	Cr.		
L.	s.	d.	L.	s.	d.	

Weekly State of Grain, Sale of Cattle, with other Occurrences.

It is the more necessary for farmers to adopt some proper mode of keeping their accounts, as their deficiency in that respect is the principal argument urged, for their being put on a different footing, *in regard to the property tax*, from the commercial classes of the community : but if they were universally to adopt a plan for keeping regular accounts, that objection would be at an end.

No. XLI.

EXTRACT OF A LETTER FROM JOHN JAY, ESQ. OF NEW YORK, TO SIR JOHN SINCLAIR, ON SALT AS A MANURE, MORE ESPECIALLY FOR FLAX.

“ You may remember my mentioning to you, that common salt had been used with success as a manure for *flax*, and my promising to procure, and transmit to you, more particular information respecting the quantity or proportion of salt, which was found to be most proper.

“ A gentleman in New England has published some facts, from which it appears, that the subject merits attention. He says, ‘ In June 1786, I salted one bed of my onions, one bed of my carrots, and one bed of my early turnips, laying the salt under the surface, in the centre of the intervals between the rows, at some distance from the roots, that the salt might have time to be dissolved and altered, before the fibrous roots should reach it. The carrots of the salted bed evidently grew much larger and better than the rest ; but I could not perceive that the salt was at all beneficial to the onions, or to the turnips.’ ”

“ According to Mr Ford’s experiment, however, in salting *flax* ground, salt seems to be highly beneficial to that crop. He spreads the salt at the time of sowing the seed, and thinks that the quantity of salt should be *double* to that of the seed. From three acres

of flax salted, he had fifty bushels of seed, and an excellent crop of flax. Mr Elliot states, that he applied five bushels of salt to one acre of *flax*, which is a much larger proportion; and that it had an extraordinary effect. Also that a crop of wheat was increased by salt."

In another communication from Mr Jay, he mentioned the following fact, regarding the best mode of manuring potatoes.

"It is the common practice, to put dung in the furrows, or trenches, and then lay the seed potatoes *upon it*; but for some years past it has been said, that the seed potatoes should be *first* placed in the furrows, and long dung put *upon* them, and then covered, as usual, with earth. Last year I planted a small piece of ground, (not rich but stiff, and inclined to bake), alternately in those methods, and the fact was, that the rows where the dung was placed over and *upon* the *seed potatoes*, yielded more than the rows where the dung was placed *under* them. This is the only experiment of the kind, which I have made, and therefore do not regard it as conclusive."

No. XLII.

HINTS REGARDING THE COCKSPUR THORN OF AMERICA, IN A LETTER FROM DR LOGAN, TO SIR JOHN SINCLAIR, DATED STENTON, MAY 7TH, 1812.

"I HAVE been desirous of procuring a quantity of the seed of the American thorn for the Board of Agriculture. With us it is preferred to any thorn ever introduced amongst us, for quickness of growth and real use as an inclosure. My sons, who are both partial to agriculture, sowed some of the seed last spring, and a few weeks since, planted them out, two and three feet in height.

"Mr Mane, a nursery-man residing near Washington, first in-

troduced this thorn to notice, and cultivated it for sale. He has relinquished his useful occupation, and I do not at present know from whence I can procure the seed—rest assured I shall keep the object in view.”

How unfortunate is it, that the wars, in which we have been engaged for so many years past, have prevented the importation of that, and many other useful articles, by which the agriculture of this country would have been greatly benefited!

No. XLIII.

LIST OF THE INTELLIGENT FARMERS, FROM WHOSE COMMUNICATIONS THE PRECEDING ACCOUNT OF THE HUSBANDRY OF SCOTLAND HAS BEEN DRAWN UP.

1. BERWICKSHIRE.

1. William Robertson, Esq. of Ladykirk.
2. George Logan, Esq. of Fishwick.
3. A. Low, Esq. Woodend.
4. David Low, Esq. ditto.
5. Mr Robert Kerr, Ayton.
6. Mr William Dudgeon, Primrose-hill.
7. Mr John Wilson, Idington Mains.
8. Mr James Wilson, Simprin.

2. ROXBURGHSHIRE.

9. Thomas Nisbett, Esq. of Mersington.
10. Robert Walker, Esq. of Wooden.
11. Adam Walker, Esq. of Mellendean.
12. Thomas Hood, Esq. Hardacres.
13. Mr Thos. Bewlie.
14. Mr Andrew Blaikie, Holydean.

3. EAST-LOTHIAN.

15. The Honourable Baron Hepburn.
16. George Rennie, Esq. of Phantassie.
17. Robert Brown, Esq. Markle.
18. David Wight, Esq. Ormiston.
19. William Hunter, Esq. of Tynefield.
20. William Hume, Esq. East-Barns.
21. Mr Rennie, Oxwell Mains.
22. Mr Dudgeon, Prora.
23. Mr Buist, overseer at Tynningham.
24. Mr Somerville, Athelstonford Mains.
25. Mr Skirving, Garleton.
26. Mr Richard Somner, Gilchriston.
27. Mr James Cuthbertson, Seton Mains.
28. Mr Murray, Kirkland-hill.
29. Mr Archibald Park, Windy Mains.
30. Patrick Brodie, Esq. Garvald.
31. Mr Robert Hope, Fenton.
32. Andrew Pringle, Esq. Ballencrief.
33. Mr John Carnegie, Drylaw-Hill.
34. Mr Adam Murray, jun.

4. MID-LOTHIAN.

35. Mr Thomas Scott, Craiglockart.
36. John Newton, Esq. of Currie-hill.
37. Mr Thomas Allan, Craigmor.
38. Mr William Gray, Gorgemoor.
39. Mr John Shirreff, Abbeyhill.
40. Mr Alexander Guthrie, of Edinburgh.
41. Mr Richard Shirreff, Dalry, near Edinburgh.
42. Gilbert Grierson, Esq. merchant, Leith.
43. Mr Robert Laing, Campend.
44. Mr George Frame, Braidwood.
45. Mr John Milne, Smeaton.
46. William Aitchison, Esq. of Clements Wells.

5. WEST-LOTHIAN.

47. Mr Thomas Trotter, Newton.
48. S. Wood, Esq. Milrig.

6. DUMFRIES-SHIRE.

49. William Stewart, Esq. of Hillside.
50. Mr John Church, Hitchill.

7. GALLOWAY, AYRSHIRE, AND CLYDESDALE.

51. Sir Alexander Gordon, of Greenlaw.
52. Mr David Shank, Curgie.
53. John Tennant, Esq. Girvan Mains.
54. Mr William Aiton, Strathaven.
55. Mr George Douglas, Aiton.
56. John Mackenzie, Esq. of Glasgow.

8. PEEBLES-SHIRE.

57. Mr Charles Alexander, Easter Haprew.

9. STIRLINGSHIRE.

58. John Campbell, Esq. of Carbrook.
59. Mr Andrew Robertson, Almon.
60. Mr Andrew Chalmers, Dunmore.
61. James Boyd, Esq. Powis.

10. CLACKMANNANSHIRE.

62. J. F. Erskine, Esq. of Mar.
63. Robert Stein, Esq. Kilbagie.
64. John Phipps, Esq. Dolls.
65. Mr John Laing, Tullybedy.
66. Mr Peter Mitchell, Balquharn.
67. Mr Alexander Kerr, Lorns-hill.
68. Rev. Dr Modie, Clackmannan.
69. Mr James Thomson, Park.

11. FIFE.

70. The Earl of Kelly.
71. John Newton, Esq. of Cartland-hill.
72. Mr Neil Ballingal, Sweet Bank.
73. Thomas Bruce, Esq. of Grangemuir.
74. Robert Spears, Esq. of Dysart.
75. William Young, Esq. of Burntisland.

12. PERTHSHIRE.

76. Sir Patrick Murray, Bart. of Ochtertyre.
77. E. Marshall Gardiner, Esq. of Hilcairnie.
78. William Blair, Esq. of Montague.
79. Mr James Kilgour, Perth.
80. Mr James Andrew, Tillilumb.
81. Mr William Cunningham, Goodlyburn.
82. Mr Henry Thomson, Muirtown of Balhousie.
83. Mr Robert Clerk.

13. CARSE OF GOWRIE.

84. George Paterson, Esq. of Castle-Huntly.
85. Mr Thomas Drummond, Westbank.
86. Mr Patrick Jack, Moncur.

14. NORTHERN DISTRICTS.

87. George Robertson, Esq. Muirton, near Bervie.
88. Mr Brown, Cononsyth, by Arbroath.
89. Mr Rennie, Kinblethmont, near Arbroath.
90. Rev. Dr Skene Keith.
91. Mr Barclay, Knock-Leith.
92. Mr John Milne, Mill of Alvah, near Banff.
93. Mr John Lawson, in the county of Banff.
94. Mr A. Wilson, near Cullen.
95. Mr Young, Morayshire.
96. Mr Sheriff, Kinmylies, near Inverness.
97. Capt. John Henderson, of Aimster, in Caithness.

**15. CORRESPONDENTS, REGARDING THE INTRODUCTION OF THE
SCOTCH SYSTEM OF HUSBANDRY INTO ENGLAND.**

98. Sir Joseph Banks.
 99. Arthur Young, Esq.
 100. James Brougham, Esq. Howis, near Penrith,
 101. William Wolstenholme, Esq. near Weymouth.
 102. George Cully, Esq. of Eastfield, by Belford:
 103. William Money Hill, Esq. of Waterden, in Norfolk.
 104. Admiral Bentinck.
 105. John Elman, Esq. Glynde, near Lewes.
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There were also a number of other intelligent proprietors and farmers, who transmitted to me very important communications, but under the express injunction that their names should not be mentioned; a circumstance much to be lamented, as their authority would have added much weight to any publication.

If the intelligent farmers, whose names are contained in the preceding list, and others who are well acquainted with the Husbandry of Scotland, were to favour the Author of this Work with their remarks upon it, he would be enabled to render it much more complete, than it possibly can be without such assistance.

There are no means by which any subject, of so extensive and so complicated a nature, as that of Agriculture, can be brought to any great degree of perfection, but first by collecting the result of the experience and observation of great numbers of *practical men*; and next, after that information has been methodised and detailed, to have it remarked upon, by other intelligent men, and discussed as thoroughly as possible.

No. XLIV.

The subjoined letter, on the size of farms in Flanders, having accidentally cast up, I thought it right to insert it in the Appendix, as an interesting communication; and as likely to promote an inquiry into the state of agriculture, in Flanders and Brabant, when those countries are again accessible to British investigation.

LETTER FROM MR GILLET, DIRECTEUR DES ATTELIERS PUBLICS
A BRUXELLES, DATED 27TH DECEMBER, 1801.

“ THE important services you have rendered to agriculture in England, will, I hope, sufficiently apologize for the liberty I take in addressing you on this subject, without having the honour of being known to you.

“ I have examined, with attention, the situation of agriculture in most countries in Europe, and I do not hesitate to affirm, that it is no where so well understood and practised as in the Low Countries. I do not except my native country, England, though I am ready to admit, that she is much advanced in this important science, beyond France, as the Low Countries are beyond England.

“ This will not surprise you, Sir, when you consider, that while the fortunes of England and France were divided between agriculture, industry, colonization, and external commerce, those of the Low Countries, were principally employed in the advancement of agriculture alone, by establishing small farms.

“ This system has succeeded admirably well in Flanders and Brabant, where land is every where in the highest state of culti-

vation, and offers a wonderful contrast with the situation of agriculture in the Liege Country, county of Namur, and the province of Hainault, which confine (bound) Flanders and Brabant.

“ There the system of large farms is still in common practice, and very little progress has been made within fifty years.

“ The vast disproportion, in the produce of those different provinces, when compared with that of Brabant and Flanders, offers a very strong argument against the system of large farms; and I urge this point with more confidence, as it is the result of experience and attentive observation, and because I learn with regret, that this mode is very predominant in most parts of England.

“ While two neighbouring countries seem to favour two systems, diametrically opposite to each other, this question certainly requires close examination. The reason is obvious. Farmers, in general, are not more exempt from ambition than men of the world. They never fancy their farms are large enough, and never think of proportioning the extent of their farms with the extent of their means.

“ It requires a larger share of understanding, arrangement, and calculation, to conduct a large farm, than falls to the lot of most common farmers. Their means, both mental and pecuniary, are seldom equal to the extent of their farms. Your experience, Sir, in this art, will make this observation trivial to you, that it is less the extent of the farm, than the excellent management of the land, and abundance of manure, that enriches the farmer; but this observation, however trivial, cannot be too strongly impressed in the minds of illiterate farmers, who are always, and in all countries, ambitious of having more land than they can well manure and cultivate.

“ From this circumstance, it happens, that agriculture most commonly languishes in large farms, and thrives only in small ones. At least it is so in this country. I know not how far this case is applicable to England.

“ The influence which you have acquired in your country, by your knowledge in this science, and the warm interest I take in every thing that can contribute to the prosperity of my native

country, engage me to request you to fix your attention on the situation of agriculture in the Low Countries, where you will find many methods, new and economical, that may be beneficially employed in England.

“ If I followed my own inclination, I would accompany this letter, with an abridged detail of the system employed in Brabant and Flanders; but as I have not the honour of being known to you, I will not presume to trespass longer on your moments, without your permission *.

“ It is an error into which many are fallen, for want of observation, and a knowledge of the interior part of the country, to believe, that the soil of the Low Countries was originally good. It is the almost incredible industry of the peasantry in Flanders, and a part of Brabant, which has rendered the soil so productive. The *Pays de Waese*, a prodigy of art, was forty years ago a *bruyere*, (a heath or waste). It is now perhaps the richest province in the world. The soil in most parts is sandy, and requires manure every year to produce plentiful crops.

“ Those who are curious in breeding cattle, may procure from this country an excellent race of cart horses, superior to any I have noticed in the rest of Europe, and they would be a precious acquisition for England.”

* Mr Gillet was applied to for the detail he mentions, but owing to some unfortunate circumstance, it never came to England.

EXPLANATION OF THE PLATES.

1. *The Berwickshire Hammels.*

The division walls which are not under cover, are only so high as to have the effect of keeping the horses or cattle perfectly separate. That part of the wall which is covered ought to be as high as the roof of the building, in order to stand the great draught of air from one end of the building to the other, thus rendering the whole much warmer.

At the side of the gates are troughs for holding turnips, water, &c.

The building, No. 8. is not separated into two divisions, but is similar to the others, with this difference, that there is a wide gateway for a cart, or any farm carriage, with a close-made gate on the north end for shelter; this alteration was thought necessary to have more ready access to different parts of the farm-offices, when that hammel happens not to be occupied.

Each hammel will hold *three* moderate sized animals, that is to say, oxen or steers below 65 stone in weight, 14 lb. to the stone. No doubt *two* is better, but that takes up room, and increases the expence of building.

These hammels completely answer the object in view.

2. EXPLANATION OF THE ENGRAVING OF THE STEAMING APPARATUS.

See APPENDIX, No. IX.

- A False bottom of the steaming box.
- B Door of the box,—To open with iron hasp, to secure it when shut.
- C The boiler.
- D The pipe for conducting the steam between the false and real bottoms of the box.

THE HAMMEL.



THE SHED FOR THE CATTLE.



Scale of 20 feet to the Inch





- E Sliding division of the box, with handles for pushing it in, and drawing it out.
 - F End view of the steaming box, with iron hasps securing the door.
 - G Roller and pipe.
 - H Side view of the steaming box.
 - I Lid moveable on hinges, and acting as a safety valve.
 - K Cock for discharging water from the boiler.
 - L Cock for discharging condensed steam, and other liquids, from the bottom of the steaming box.
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3. DESCRIPTION OF AN IRON PLOUGH, CONSTRUCTED BY MR JOHN WILKIE, AT UDDINGSTON, NEAR GLASGOW.

- FIG. I. and II. Plan and profile of an iron plough, wherein the same letters represent the same parts.
- A B Represent the beam; B C the left-hand stilt, or large handle.
 - D E The right-hand stilt, or lesser handle.
 - F G H The stock or share, placed on the fore-end of the head.
 - I I The coulter, fixed into a hole or mortise in the beam.
 - G K The mould-board, fastened upon the furrow, or right-hand side of the sheath, and lesser handle.
 - D N O The rods of iron that connect the two handles, and also hold them at a proper distance from each other.
 - L M The muzzle or bridle, placed upon an iron bolt, which passes through a hole in its arms; and the fore-part of the beam at A, upon the back-end of the bridle at M, is a cross, in which are several holes, to receive a bolt that passes through one of these holes, and one in the beam, so that by shifting this bolt in the different holes of the cross M, the bridle, having liberty to turn on the bolt at A as a centre, the fore-end L of the bridle can easily be either raised or depressed, in order to give the plough a greater or lesser hold of the ground as may be found the most convenient.

No. XLV.

EXTRACT OF A LETTER FROM CHARLES DUDGEON, ESQ. OF PROR,
IN EAST-LOTHIAN, TO SIR JOHN SINCLAIR, REGARDING THE
EXPENCE OF THRESHING CORN BY THE FLAIL.

I HAVE lately found the form of a table, by which all my payments to my *taskers* were regulated ; and it was the easiest and most simple, as well as the most correct method of settling that business. These taskers were the people employed to thresh the corn, before the invention of threshing-mills, and they received 1-25th part of the grain they threshed, or its value. They were entirely ignorant of fractions, but yet were so minute in their calculations, as to require more attention in fixing their accounts, than matters of much more importance. No objection, however, could ever yet be found, to estimates made, with due attention, from the following table.

The particular object I have in view, by sending it to you at present, when it may seem no longer of any real use, is, that if preserved in the next edition of your Husbandry of Scotland, it may serve occasionally to assist, in making comparative statements of our ancient and modern expences of threshing, which may sometimes be reverted to, either for amusement, or for purposes of utility.

For instance, a farmer of modern times threshes $49\frac{5}{8}$ bolls of wheat by the mill, and having ascertained the exact expence, wishes, from curiosity, to know, what that very work would have cost, had the flail still been in use. Let it be supposed, that wheat, in this case, sells at 92s. *per* boll, a price which has actually been obtained.

Now the lot, (or value of the 25th part), of one boll at 92s. is 3.68 shillings ; and $49.75 \times 3.68 = 183.08$ shillings, that is, £.9 : 3 : 0 96, or nearly £.9 : 3 : 1 for $49\frac{5}{8}$ bolls, or L. 9, 3s.; and,

Were the price 92s. 3d. then lot = 3.69

or	92s. 6d.	3.70
or	92s. 9d.	3.71

Table of the Lot or Price of threshing one Boll, at various Prices, from 10s. to 1.5 per boll.

Price.	Lot.	Price.	Lot.	Price.	Lot.	Price.	Lot.	Price.	Lot.	Price.	Lot.	Price.	Lot.
"	Shill.	"	Shill.	"	Shill.	"	Shill.	"	Shill.	"	Shill.	"	Shill.
At 10 per boll	00.40	At 29 per boll	1.16	At 48 per boll	1.96	At 67 per boll	2.68	At 86 per boll	3.44	At 105 per boll	4.12	At 124 per boll	4.88
11	.44	30	1.20	49	1.96	68	2.72	87	3.48				
12	.48	31	1.24	50	.00	69	2.76	88	3.52				
13	.52	32	1.28	51	2.04	70	2.80	89	3.56				
14	.56	33	1.32	53	2.08	71	2.84	90	3.60				
15	.60	34	1.36	53	2.12	72	2.88	91	3.64				
16	.64	35	1.40	54	2.16	73	2.92	92	3.68				
17	.68	36	1.44	55	2.20	74	2.96	93	3.72				
18	.72	37	1.48	56	2.24	75	3.00	94	3.76				
19	.76	38	1.52	57	2.28	76	3.04	95	3.80				
20	.80	39	1.56	58	2.32	77	3.08	96	3.84				
21	.84	40	1.60	59	2.36	78	3.12	97	3.88				
22	.88	41	1.64	60	2.40	79	3.16	98	3.92				
23	.92	42	1.68	61	2.44	80	3.20	99	3.96				
24	.96	43	1.72	62	2.48	81	3.24	100	4.00				
25	1.00	44	1.76	63	2.52	82	3.28						
26	1.04	45	1.80	64	2.56	83	3.32	N. B. Every 1s. is represented by .04					
27	1.08	46	1.84	65	2.60	84	3.36	.02					
28	1.12	47	1.88	66	2.64	85	3.40	.01					

No. XLVI.

ORIGIN AND PROGRESS, &c. OF FEUING IN THE AGRICULTURAL VILLAGE OF GORDON IN BERWICKSHIRE.

BY THE REVEREND ROBERT LUNDIE, MINISTER OF KELSO, BUT
FORMERLY OF GORDON.

I. *Origin and Extent of Feuing in and near Gordon.*

PREVIOUS to the year 1770, the village of West Gordon consisted of a considerable number of ill-built hovels, cemented with clay, occupied by cottagers and labourers, and of some better dwellings, inhabited by the small farmers, who then were tenants of a considerable portion of the Green-Know estate. The village straggled irregularly over a considerable extent of ground, intersected with lanes and roads, that rendered it unproductive and useless. To the east and north of the village was a stony, or rather rocky, moor, used as a common by the small tenants of the arable land, and other inhabitants of the village, where their cattle picked up some scanty nourishment; but it was productive of no benefit whatever to the proprietor, George Pringle of Terwoodlee, to whom also the village then belonged, as well as the estate of Green-Know. The distance from coal and lime, either from Northumberland, on the south-east, or from Mid-Lothian on the north-west, is from 22 to 24 English miles; and the state of the roads, at that period, in the neighbourhood of Gordon, in every direction, was so extremely bad, that almost every thing was carried to and from the place on the backs of horses. Yet, as a spirit of improvement began to prevail, it occurred to Mr Pringle, that the village might be greatly improved, the inha-

bitants rendered more comfortable, and himself, as proprietor, considerably benefited, by feuing out the ground upon which it stood, on a regular plan, and on liberal principles, to persons who might be able and willing to conform to his regulations. Accordingly, about the year 1770, the road through the village was made to run in a direct line from east to west, along its whole extent, and was rendered wide and commodious, and the ground on the north and south of the road, was divided into a considerable number of feus, each of which extended 50 feet in front, towards the road, and 100 feet backward. It ought also to be mentioned, that in laying off these feus, the proprietor left about 12 feet on the north side of the village, and about 15 on the south side, as an open space between the feus and the street or road, as an accommodation to the respective inhabitants in front of their houses; they were prohibited, however, very properly, from placing dung-hills, peat-stacks, or any other obstruction on this ground. The feuing of the village, begun, as has been already observed, by Mr George Pringle, was continued by the succeeding proprietor of Torwoodlee, James Pringle, Esq. while he retained the Green-Know estate, and completed by the late George Fairholme, Esq. after he had purchased it from his cousin Mr Pringle. There are above 100 of these feus at the present time. They were granted in perpetuity; the price of each was L.5 sterling of premium, and one shilling, and what is called a kain-hen, or fowl, *per annum*. The effects of this system were, to confine the village within much narrower limits than it formerly occupied, to render it neater and more commodious in every respect, to add to its population, and to save a considerable quantity of ground, formerly waste, to the proprietor and tenants.

The feuing of the moor did not commence till 14 years after that of the village, viz. in 1784. The idea, it is believed, was first suggested by an acute and intelligent tenant upon the estate, and the plan for its execution was laid down by the late Alexander Hay, Esq. of Mordington, in Berwickshire. This gentleman, an advocate by profession, was the eldest son of Lord Huntingdon, formerly one of the judges of the Court of Session. Mr Hay was both a scientific and a practical farmer, and by the skil-

ful and extensive experiments which he made on his property at Mordington and Thornidyke, &c. he is to be regarded as one of the fathers of the excellent system of husbandry which now prevails in this part of the kingdom. This gentleman, esteeming the ground to be feu'd as of two qualities, valued the best at £.5 sterling premium *per* English acre, the next at £.3 *per* acre, and each at one shilling feu-duty *per* acre annually. Mr Wilson, the schoolmaster of the parish, was the most extensive purchaser under this plan, the land feu'd by him being about 75 acres. Various other persons became feuers, in different proportions.

II. *Progress of Improvement.*

At the time when the system of feuing already described commenced, the land did not bring a penny into the pocket of the proprietor, and had it been let, would not probably have brought a rent of one shilling *per* acre. It was, in fact, a dreary uninclosed waste, inlaid with hard and large masses of whin-stone, and partially covered with stunted heather. The feuers began their operations by raising and laying above ground such of the stones as were moveable by their own strength, aided with picks, hammers, and wooden and iron levers, of various lengths. It may here be remarked, that though wooden levers are now in a great measure laid aside, they are in some respects more useful for this purpose, especially when made of oak, than those made of iron. When the stones were too large to be removed by the direct application of human strength, (and this was very frequently the case), they were bored in different places, and burst asunder by the force of gunpowder, till they became of such a size as to be easily laid upon the surface. From these stones the feuers found excellent materials for building their houses, and inclosing their ground. In order to get quit of a considerable part of the stones, they were induced to form the land, as they cleared it, into very small inclosures, generally not exceeding an acre, and sometimes of much smaller extent; and, taking care to leave the ground upon which the fence-dykes were to be built, in its natural rocky state,

they formed the dikes three feet thick at the base, one foot eight inches at top, and from five to six feet in height. In some cases they piled up the stones in large regular heaps, till they might be wanted by themselves or neighbours; and in one instance, a fence-wall was built of the thickness of 18 feet. A very large quantity also, was disposed of for under-ground drains, which were made of a much larger size than would otherwise have been necessary for carrying off the superfluous moisture. Sometimes excavations in the form of drains were dug, merely for the purpose of burying the stones, and of enabling the feuers to employ the subsoil taken out from such excavations, in filling up the hollows and vacancies occasioned by the removal of the stones in different parts of the surface. As the feuers at first generally occupied themselves and their families, at their leisure hours, in clearing the ground by degrees, it is not easy to estimate the original expence of laying the stones on the surface, and breaking them down to such a size as to render them fit to be put in a cart to be removed. The price, too, must of course vary, in proportion to the probable quantity of stones to be removed. Of late years, this operation has cost from L.10 to L.25, which latter is the largest sum yet given when the work was done by contract. This most difficult and laborious process of laying the stones on the surface being accomplished, the next step is to get them removed, which is generally done by means of hand-barrows, when they are used for fencing the ground out of which they are taken, as already described, or by strong carts constructed for the purpose, when they are to be carried off the ground. The land, after being cleared, was generally allowed to lie one or two years uncultivated, in order to allow time for the vegetable substances found in it, and turned up by the operation of clearing, to rot and mix with the soil. The feuers at the end of this period, generally allowed 60 Winchester bushels of shell-lime *per acre* for its improvement, which, at the rate of two shillings *per bushel*, caused them to incur an additional expence of L.6 *per acre*. There are at this time about 200 acres of the feued moor cleared, inclosed, and improved as above, besides some small clumps of wood, planted by the feuers

on parts of the ground in its original state, and these are in a very thriving condition. Some of the land thus cleared, and originally not worth one shilling *per acre*, has been let by the feuars at a rent of from 40s. to 60s. *per acre*. The surface of the soil was at first of a poor quality, and so loose and light, that when turned up with the spade or plough, it was liable to be blown away by the wind. On going down from six to twelve inches below the surface, the subsoil is in general a sandy till, which being mixed with the surface-earth, and improved with lime and dung, is found to yield much better crops than when such improvement is bestowed on the surface-earth alone. The whole land was almost covered with whin-stone, from the depth of one, to six or eight feet, below which, and at the depth of from nine to twelve feet, there is a bed of free-stone. The soil thus improved, is like the rest of the parish in general, light and fertile, and is found well adapted for the turnip husbandry, which is nowhere better understood, nor more successfully practised, than in this neighbourhood.

In giving a statement of facts on this subject, it may be proper to mention, that about the year 1802, during my incumbency, the grass glebe of Gordon, which was a bank well calculated for being planted, and so situated as to be very convenient and ornamental to the Green-Knowe property, was exchanged for a portion of infiel'd land, on part of which a new manse was to be built, and between three and four English acres of moor-ground, situated between the arable land of the glebe, and the new turnpike-road leading from Kelso to Edinburgh. During my incumbency at Gordon, I had about a third part or upwards of this ground cleared, and found it an excellent quarry for whin-stone to be employed in building, road-making, and other useful purposes in the parish. According to the best calculation I can make, I do not think there were less than from 800 to 1000 cart-loads of stones *per acre*, weighing at an average about 10 cwt. *per cart-load*. Many of the masses of stone were bored and blown with gun-powder, some of them probably weighing, in their natural state, from four to six tons. They were then broken into pieces of different sizes, so as to render them fit for being carted

away. Having limed the part of the land cleared by me, the remainder was left in its natural state to my successor Mr Morrison, who has since cleared it at a great expence, and is, I believe, gradually reimbursing himself by the crops which the ground now yields.

The part of the moor-ground, between the glebe and the new turnpike-road, which remained in the hands of the proprietors, was, in consequence of an agreement made at the time of the exchange, planted while in its natural state ; and as the ground thus planted extends along the western boundary of the glebe, till it joins the new plantation before mentioned, on the north and east, it seems to place the glebe in a semicircle of wood, and has already added much to the beauty of a district, which has hitherto been remarkably naked, though the surface is agreeably varied. In the course of a few years, it will form a very useful shelter to the adjoining ground.

The soil of the parish of Gordon, in general, has undergone great and rapid improvement within the last 30 years ; and it is an honourable proof of the skill and enterprize of the farmers to state, that several hundred acres, as bad in every respect as the moor-ground already described, have been cleared by the tenants, entirely at their own expence, on leases of twenty-one years. In some cases the proprietors built the fences, the farmers raising the stones from the ground ; and in some other instances, they allowed the tenants a small sum for carting the stones and building the dikes ; for which the tenants were bound to pay interest, at the rate of *5 per cent.* to the end of their leases. The expence of improving such ground must depend in a great measure upon the manner in which the stones are disposed of. In some cases, where the stones are to be removed from the ground, for the mere purpose of clearing it, the average expence of clearing a single acre of this description of moor-land, at the present time, including the levelling and lime necessary to render it fit for cropping, cannot, I think, be estimated at less than forty guineas.

III. Effects of the Feuing above described on the Character and Prosperity of the People.

It will not admit of a moment's doubt, that the plan above detailed, has been a very beneficial one to the proprietors, and more especially to those whose lands have been improved by the voluntary exertions of the tenants, under the ordinary leases of the country. It must also be admitted, that this system has, by the most laborious exertions, been permanently productive of a large quantity of human food, and thus has a tendency directly favourable to population. It is also true, that by the industry to which the original feuars and their families were inured, in consequence of the labour necessary to render their purchases beneficial to themselves, a number of valuable labourers were obtained, who, on any emergency, were ready to aid, for reasonable wages, the neighbouring farmers, in any agricultural operations or improvements, in which their services might be required. The effects upon the character and prosperity of the feuars themselves, may be supposed to admit of much greater doubt; and there is some reason to apprehend, that when the business of clearing their feus is at an end, they will be apt to trust to the produce of them for support; and to waste, in the half employment which their possessions may afford, a large portion of that time which might be employed in a manner more beneficial to themselves and the community. This, however, is only a contingent evil, which hitherto has had no existence in fact; on the contrary, the inhabitants in general are an independent, honest, and industrious people; and I have pleasure in stating, for the credit of those who were once under my pastoral care, that several respectable tradesmen and shopkeepers in Kelso have informed me, that after having had large dealings with them for twenty or thirty years, they had not lost a single shilling by the credit which they had frequently given them. This will be considered as a most satisfactory proof, not only of their honesty,

but of the success by which their exertions have been attended ; and I do not know any one of them who does not consider the money and labour which the feus have cost, as sufficiently rewarded by the benefits received.

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END OF VOLUME SECOND.







